OCEANA

2501 M STREET NW, SUITE 300 WASHINGTON, DC 20037 202.833.3900 WWW.OCEANA.ORG

March 24, 2004

The Honorable Donald L. Evans
Secretary
United States Department of Commerce
14th Street and Constitution Avenue, NW
Room 5851
Washington, D.C. 20230-0001

Re: Rulemaking Petition to Protect Deep-Sea Coral and Sponge Habitat

Dear Secretary Evans:

Marine scientists are discovering extraordinary, fragile, and ecologically-important colonies of deep-sea corals and sponges in nearly every region of the United States' exclusive economic zone (EEZ). Researchers report that these deep-sea coral and sponge colonies support entire ecosystems of fish and invertebrates, including commercially-managed species. The high diversity of marine life in some of these coral and sponge ecosystems is comparable to shallow, warm-water, coral reef ecosystems. Many of these colonies are truly ancient, growing for many hundreds and even thousands of years.

As these communities are comprised of long-lived, slow-growing organisms, they are especially vulnerable to destructive fishing practices like the use of bottom-tending mobile fishing gear[1] (bottom trawling) that damage and destroy these sensitive biological systems (NRC 2002). These ancient and slow-growing communities are not protected adequately under existing fishery management plans (FMPs), nor would they be under pending rulemakings that do not take into account the most recent scientific data. Ongoing efforts to designate essential fish habitat (EFH) are proceeding so slowly that without immediate protection, many of these sensitive habitats will suffer irreparable harm.

In light of recent scientific discoveries about the nature and extent of deep-sea coral and sponge habitats, and the immediate threats they face, existing law requires you to take strong steps to protect these habitats from destructive fishing practices. Accordingly, Oceana requests, pursuant to 5 U.S.C. §553(e), that the Department of Commerce, through the National Marine Fisheries Service (NMFS), initiate immediate rulemaking to

[1] "Bottom-tending mobile fishing gear" includes dredges, beam and otter trawls, and other mobile fishing gear that is dragged along the ocean floor.

protect deep-sea coral and sponge habitats in the United States' EEZ by taking the following measures:

1. Identify, map, and list all known areas containing high concentrations of deep-sea coral and sponge habitat;[2]
2. Designate all known areas containing high concentrations of deep-sea coral and sponge habitat both as EFH and "habitat areas of particular concern" (HAPC) and close these HAPC to bottom trawling;
3. Identify all areas not fished within the past three years with bottom-tending mobile fishing gear, and close these areas to bottom trawling;
4. Monitor bycatch to identify areas of deep-sea coral and sponge habitat that are currently fished, establish appropriate limits or caps on bycatch of deep-sea coral and sponge habitat, and immediately close areas to bottom trawling where these limits or caps are reached, until such time as the areas can be mapped, identified as EFH and HAPC, and permanently protected;
5. Establish a program to identify new areas containing high concentrations of deep-sea coral and sponge habitat through bycatch monitoring, surveys, and other methods, designate these newly discovered areas as EFH and HAPC, and close them to bottom trawling;
6. Enhance monitoring infrastructure, including observer coverage, vessel monitoring systems, and electronic logbooks for vessels fishing in areas where they might encounter high concentrations of deep-sea coral and sponge habitat (including encountering HAPC);
7. Increase enforcement and penalties to prevent deliberate destruction of deep-sea coral and sponge habitat and illegal fishing in already closed areas; and
8. Fund and initiate research to identify, protect, and restore damaged deep-sea coral and sponge habitat.

Oceana is prepared to assist you in carrying out these measures in any way it can.

I. <u>Federal Law Requires the National Oceanic and Atmospheric Administration (NOAA) to Identify and Protect Essential Fish Habitat and Habitat Areas of Particular Concern</u>

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires fishery management plans prepared by the Secretary and Regional Fishery Management Councils to identify essential fish habitat and habitat areas of particular concern. EFH is defined as "waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." 16 USC §1802(10). HAPC are areas that: (1) provide important ecological functions; (2) are sensitive to human-induced environmental

[2] "Deep-sea coral and sponge habitat" includes all habitat containing high concentrations of either deep-sea coral or deep-sea sponges or both.

degradation; (3) are stressed by development activities; or (4) are a rare habitat type. 50 CFR §600.815(a)(8).

A. National Oceanic and Atmospheric Administration's Duties to Identify Essential Fish Habitat

The Magnuson-Stevens Act requires that FMPs prepared by Fishery Management Councils or the Secretary "describe and identify essential fish habitat based upon guidelines established by the Secretary …, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of EFH." 16 USC §1853(a)(7).

The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." 16 USC §1802(10). For the purposes of this definition:

> 'Waters' include aquatic areas and their associated physical, chemical and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; 'substrate' includes sediment, hard-bottom, structures underlying the waters, and associated biological communities; 'necessary' means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and 'spawning, breeding, feeding, or growth to maturity' covers a species' full life cycle.

50 CFR §600.10. Therefore, waters or substrate necessary to fish for spawning, breeding, feeding, or growth to maturity must be identified as EFH by NMFS or the Councils, and adverse effects on such habitat caused by fishing must be minimized to the extent practicable.

B. NOAA's Duties to Identify Habitat Areas of Particular Concern

NOAA guidelines provide that:

> FMPs should identify specific types or areas of habitat within EFH as habitat areas of particular concern based on one or more of the following considerations: (i) the importance of the ecological function provided by the habitat, (ii) the extent to which the habitat is sensitive to human-induced environmental degradation, (iii) whether, and to what extent, development activities are, or will be, stressing the habitat type, (iv) the rarity of the habitat type.

50 CFR §600.815(a)(8). Therefore, NMFS or the Councils must identify and designate HAPC within EFH if such areas meet one or more of the four criteria listed in 50 CFR §600.815(a)(8).

II. NOAA's Duties to Evaluate the Effects of Fishing on EFH and HAPC and Minimize Adverse Effects

It is not enough merely to identify EFH and HAPC. NOAA must also ensure that FMPs evaluate the adverse effects of fishing on EFH and minimize and mitigate such adverse effects. The evaluation should consider the effects of each fishing activity on each type of habitat found within the EFH, any adverse effects on EFH, and the cumulative effects of multiple fishing activities on EFH. The evaluation should also give "special attention" to adverse effects on HAPC and identify for possible designation as HAPC "any EFH that is particularly vulnerable to fishing activities." 50 CFR §600.815(a)(2)(i).

FMPs must also "minimize to the extent practicable adverse effects (on EFH) from fishing, and identify other actions to encourage the conservation and enhancement of such habitat." 16 USC §1853(a)(7). NOAA guidelines require the Councils to "prevent, mitigate, or minimize any adverse effects from fishing, to the extent practicable, if there is evidence that a fishing activity adversely affects EFH in a manner that is more than minimal and not temporary in nature." 50 CFR §600.815(a)(2)(ii).

Therefore, NMFS and the Councils must identify EFH that is particularly vulnerable to fishing activities for possible designation as HAPC; evaluate adverse effects of fishing on EFH, giving special attention to adverse effects on HAPC; and minimize to the extent practicable adverse effects of fishing on EFH.

III. Areas of Coral and Sponge in Regions Across the Country

Deep-sea coral and sponge communities are found throughout the United States' EEZ. The following gives a short overview of known coral and sponge cover in regions off the mainland United States. Additionally, pinnacles and seamounts are rare and exceptional formations that are essential fish habitat rich with the formation of living seafloor such as corals and sponges. We have sufficient data and information about certain areas, including some seamounts and pinnacles, of particular sensitivity, diversity, and rarity, to designate and protect the areas immediately. These areas, identified in Appendix 1, should be given priority for protection from bottom trawling. The locations of additional unexplored seamounts and pinnacles in Alaskan waters are listed in Appendix 2. As these types of areas have been identified as frequently harboring concentrations of corals and sponges, they should be closed until such time as research has been completed to determine whether they warrant long-term protection as HAPC. It should be noted, however, that neither list is meant to be exhaustive. They simply set forth examples of the types of known areas that exist around the United States that should be given priority when considering HAPC designation.

A. Alaska

Scientists estimate that more than 100 deep-sea coral and sponge species are found in the waters of the North Pacific off Alaska, at least 34 of which are corals (Heifetz 2000). Some areas are so tightly packed with different corals, sponges and other marine life that they have been named “coral gardens” and the “Garden of Eden” (NOAA 2002a).

In the Bering Sea most corals are found on the slope at the edge of the continental shelf and in canyons, but an array of other seafloor habitats also enrich this fertile ocean ecosystem. On the shelf, soft corals, sponges, and other deep-sea invertebrates provide living structure on an otherwise barren seafloor.

The 1600 km volcanic Aleutian Island chain between Alaska and Russia is the longest archipelago in the world. Some of the most nutrient-rich water from the bottom of the Pacific Ocean flows through the rocky passes between the islands on its way to the Bering Sea and Arctic Ocean. The unique combination of rich nutrients and underwater volcanoes has created some of the most diverse and abundant coral habitat left on Earth, with density and diversity comparable to that of coral reefs in the tropics (Stone and Malecha 2003).

The Alexander Archipelago in the Gulf of Alaska contains complex seafloor with abundant red tree corals (*Primnoa* spp.[3]), a variety of sponges, and anemones. Red tree corals can grow two meters high and seven meters wide, can live for hundreds of years, and provide shelter for a wide variety of fish and other marine life (Krieger and Wing 2002). Sea whip groves and coral gardens off Kodiak Island are home to a variety of rockfish, king crab, and other important species. The rich continental slope dives deep to the Aleutian Trench in the western Gulf. Seamounts, or underwater mountains, are scattered throughout the Gulf of Alaska and contain dense coral gardens far out at sea.

Figure 1 depicts known coral and sponge distribution in Alaskan waters, based on NMFS trawl surveys and observer data. Figures 2a-g show the locations of six coral gardens off the Aleutian Islands that were proposed by NMFS for HAPC designation on January 9, 2004. Examples of available research on coral and sponge habitat off Alaska are listed below.

- Freese, J.L. 2003. “Trawl-induced damage to sponges observed from a research submersible.” Marine Fisheries Review 63:3 7-13.
- Heifetz, J. 2000. “Coral in Alaska: Distribution, abundance, and species associations.” Manuscript presented at the First International Symposium on Deep-sea Corals, Dalhousie University, Halifax, July 30 - August 2, 2000.
- Krieger, K.J. 2001. “Coral (Primnoa) impacted by fishing gear in the Gulf of Alaska.” In Willison, J.H., J, Hall, S.E. Gass, E.L.R. Kenchington, M. Butler and

[3] The abbreviation “spp.” indicates that the name of a genus has been given, and that there are multiple species within the genus.

P. Doherty, 2001. "Proceedings of the First International Symposium on Deep-Sea Corals." Ecology Action Center.

- Krieger, K.J. and B. Wing 2002. "Megafauna associations with deepwater corals (*Primnoa* spp.) in the Gulf of Alaska." Hydrobiologia 471: 83-90.
- NMFS (National Marine Fisheries Service) 2003. Draft Programmatic Supplemental Groundfish Environmental Impact Statement for Alaska Groundfish Fisheries, September 2003, Tables 3.5-158 and 4.1-8. http://www.fakr.noaa.gov/sustainablefisheries/seis/intro.htm.
- NOAA 2002a. Ocean Explorations: Exploring Alaska's Seamounts. Log at http://oceanexplorer.noaa.gov/explorations/02alaska/logs/jul15/jul15.html.
- Malecha, *et al.* 2002 (DRAFT). "Living substrate in Alaska: Distribution, abundance and species Associations." Manuscript submitted at the Symposium on Effects of Fishing Activities on Benthic Habitats, Tampa, Florida, November 12-14, 2002.
- Stone, R.P. and Malecha, P.W. 2003. "Deep-Sea Coral Habitat in the Aleutian Islands of Alaska." Oral Presentation given at the Second International Symposium on Deep-sea Corals, Erlangen, 2003.

B. Pacific

Scientists have found at least 100 different species of coral along the Pacific shelf and slope from the Bering Sea to Baja, including bamboo, bubblegum, red tree, and black corals (Etnoyer and Morgan 2003). Several underwater islands lie in the deep-waters beyond the California continental shelf. On the largest of these, the Davidson Seamount, scientists using submersibles have found densely packed biological communities consisting mainly of large gorgonian corals and sponges (NOAA 2003).

In the Pacific Northwest, deep underwater canyons like Astoria Canyon, where the Columbia River meets the ocean, are home to a variety of coral and sponge habitats. Hecata Bank off the Oregon coast is a hotspot for black corals. The Olympic Coast National Marine Sanctuary off Washington is also home to a variety of gorgonian corals and other vulnerable fish habitats. Puget Sound contains hydrocorals scattered throughout its various inlets and islands. These complex habitats provide homes for commercially important and overfished species like rockfish.

Submersible dives over the rocky banks along the continental shelf of Oregon in 1987-1990 revealed high abundances of sponges. The ridge-boulder habitat of Heceta Bank provides a solid substrate for a very even distribution of vase sponges. The researchers noted spectacular schools of yellowtail and juvenile rockfish associated with this habitat, comprising hundreds or even thousands of individuals. Daisy Bank consists largely of boulder-cobble habitat, upon which the sponges are even more common and larger (some a meter tall) than at Hecata. This habitat supports rosethorn, sharpchin, and pygmy rockfish, as well as lingcod and juvenile rockfish (Hixon *et al.* 1991, Figure 3).

Off the coast of California, the continental shelf, slope, and canyons are scattered with deep-sea corals. Hydrocorals, gorgonian corals, and black corals are found in high densities in the Channel Islands, Monterey Bay, the Gulf of the Farallones off San Francisco, and the continental slope off Northern California. Hydrocorals and gorgonian sea fans are commonly seen by divers in Southern California. These corals provide shelter for a variety of sea life, including rockfish, crabs, garibaldi, and many others. Some of these corals may be older than the towering redwoods on the adjacent land.

Figures 4 and 5 show coral and sponge occurrence along the Pacific Coast of North America, based on data from NMFS trawl surveys, observer programs (in Alaska), and submersible dives. Examples of available research on coral and sponge habitat in the Pacific are listed below.

- Etnoyer, P and L. Morgan 2003. "Occurrences of habitat forming deep-sea corals in the Northeast Pacific Ocean: A report for NOAA's Office of Habitat Protection." Marine Conservation Biology Institute.
- Hixon, M.A., Tissot, B.N., and W.G. Pearcy 1991. "Fish assemblages of Rocky Banks of the Pacific Northwest." OCS Study MMS 91-0052. Pacific OCS Region, Minerals Management Service.
- Monterey Bay Aquarium Research Institute seabed mapping program, at http://www.mbari.org/data/mapping/seamounts/davidson.htm .
- NMFS 2003b. Unpublished data from RACEBASE, NMFS' trawl survey database.

C. Northeast and Mid-Atlantic

Seventeen species of stony coral have been found in the waters from the Gulf of Maine to Cape Hatteras, 71 percent of which lie in waters deeper than 1000 m (Cairns and Chapman 2001). Red tree and bubblegum corals are common on the Northeast Peak of Georges Bank and on gravel substrate in the Gulf of Maine (Watling and Auster 2004).

Twenty five species of hard and soft coral have been found in the canyons and slope south of Georges Bank (Watling and Auster 2004). In particular, Oceanographer and Lydonia Canyons on Georges Bank harbor many species of coral (Figure 7). The steep sides and hard walls of these canyons have traditionally proven difficult to fish with mobile bottom gear, but improved mechanical, electronic, and fiber technologies could result in the expansion of trawl fisheries into these areas.

Bear Seamount, the westernmost peak of the New England Seamount chain, rises up from the continental slope southeast of Lydonia Canyon. One of four of the peaks in this chain that is located within the United States' EEZ, it rises from a depth of 2000-3000 m to a generally flat summit at around 1100 m below the surface of the North Atlantic. Recent dives on Bear Seamount have discovered various gorgonians including

Paragorgia sp.[4], bamboo coral (*Keratoisis* sp.), and hard corals such as *Caryophyllia ambrosia* and *Flabellum alabastrum*. The fauna associated with Bear Seamount are highly diverse (at least 214 species of invertebrates and 203 species of fish have been discovered so far), and other New England seamounts may also harbor a high diversity of macro-organisms (Moore *et al.* 2002). Indeed, NOAA's 'Mountains in the Sea' exploration in the summer of 2003 discovered corals on Kelvin and Manning Seamounts, the latter so diverse that the lead scientist, Dr Les Watling, noted a greater "coral diversity than I've seen before on any single dive, and that includes Hawaii" (NOAA 2003).

Figures 6 and 7 show the regional scale distribution of known octocorals (previously Alcyonaria) off the northeast United States.

Examples of available research on coral and sponge habitat in the Northeast and Mid-Atlantic are listed below.

- Auster, P.J. 2002. "An underwater tour of oceanographer canyon" CDROM National Undersea Research Center, University of Connecticut, Avery Point.
- Cairns, S.D. and R.E. Chapman 2001. "Biogeographic affinities of the North Atlantic deep-water Scleractinia." In Willison, J.H., J, Hall, S.E. Gass, E.L.R. Kenchington, M. Butler and P. Doherty, 2001. "Proceedings of the First International Symposium on Deep-Sea Corals."
- Moore, J.A., Vecchione, M., Collette, B.B., and R. Gibbons 2002. "The fauna of Bear Seamount (New England Seamount chain), and the presence of "natural invader" species." Paper presented at ICES 2002 Annual Science Conference summarizing the results of cruise DE02-06. CM 2002/M:25.
- NOAA 2003. Ocean Explorations: Mountains in the Sea. Ship's log and other details available at http://oceanexplorer.noaa.gov/explorations/03mountains/welcome.html
- Watling, L, and P.J. Auster 2004 in press. "Distribution of Deepwater Alcyonacea off the Northeast Coast of the United States". Presented at the Second International Symposium on Deep-Sea Corals, Erlangen, 2003.

D. Southeast

Deep-sea corals have been found from between 70 to 1300 meters deep on the outer continental shelf and upper slope in Southeast United States waters (Reed 2002a). Extensive *Lophelia* reefs are being explored off Cape Lookout in North Carolina at 400-500 meters, but there are hundreds of larger unexplored *Lophelia* reefs off the coasts of South Carolina, Georgia, and Florida (Sulak pers.comm.). In 2002, scientists discovered a huge *Lophelia* reef 140 km off the coast of Jacksonville, Florida, roughly 1.6 by 4 km

[4] The abbreviation "sp." is used after a genus name to indicate that the genus, but not the particular species of the specimen, has been identified.

in area, and 150 meters high (NOAA 2002c). There are believed to be 40,000 *Lophelia* mounds covering 360 square km in the vicinity of the reef (Paull *et al.* 2000). Sponges, corals, sea plumes, and other animals have been found covering one area explored at 600 meters (NOAA 2002d).

The deep-sea reefs of *Oculina varicosa*, the ivory tree coral, found in this region are unique in the world (Koenig 2001). Deep-water banks rich with *Oculina varicosa*, *Lophelia pertusa*, *Enallopsammia profunda*, and other live coral and sponge colonies off the coasts of Florida, Georgia, and South Carolina are described and mapped in Reed (2002a).

Figures 8 and 9 show some known locations of corals off the Southeast United States, including *Oculina*, *Lophelia*, and *Enallopsammia*. Examples of available research on coral and sponge habitat in the Southeast are listed below.

- Koenig, C.C. 2001. "Oculina Banks: Habitat, fish populations, restoration, and enforcement." Report to the South Pacific Fishery Management Council December 2001.
- NOAA 2002. Ocean Explorations: Islands in the Stream 2002. Ship's log and more details available at http://oceanexplorer.noaa.gov/explorations/02sab/welcome.html.
- Paull, C.K., A.C.Neumann, B.A. am Ende, W. Ussler III, N.M Rodriguez 2000. "Lithoherms on the Florida-Hatteras slope." Marine Geology 166: 83-101
- Reed, J.K. 2002a. "Comparison of deep-water coral reefs and lithoherms off southeastern USA." Hydrobiologia 471: 57-69.
- Reed, J.K. 2002b. "Deep–water Oculina coral reefs of Florida: biology, impacts, and management." Hydrobiologia 471: 43-55.
- Sulak, K. pers. comm. Presentation to the House Oceans Caucus and NMFS March 14 2003, background materials. Available upon request.

E. Gulf of Mexico

Ancient coral reef structures dot the outer continental shelf off Mississippi, Alabama, and West Florida. Although the original reefs are gone, lush forests of soft corals, black corals, sponges, sea-lilies, and deep-sea stony corals still flourish on the steep pinnacles. Despite the discovery of deep-sea corals in the Gulf of Mexico well over a hundred years ago, our knowledge of their distribution and abundance is poor.

In a recent review article, Schroeder *et al*. (in press) document all known locations of the hard stony corals *Lophelia pertusa* and *Madrepora oculata* in Gulf waters deeper than 200 meters. Both species have been found in waters between 200-850 meters in the Northern Gulf of Mexico (Figure 10). These species appear to be particularly concentrated off the coasts of Louisiana, Mississippi, and Alabama, though the dearth of known coral sites in other areas may reflect lessened research efforts in those areas rather than fewer corals. Some coral areas have been visibly damaged by trawls, longlines, and anchors (Sulak pers. comm.).

Examples of available research on coral and sponge habitat in the Gulf of Mexico are listed below.

- NOAA 2002b. Ocean Explorations: Gulf of Mexico. Ship's log and more details available at http://oceanexplorer.noaa.gov/explorations/02mexico/logs/oct18/oct18.html.
- Schroeder, W.W., Brooke, S.D., Olson, J.B., Phaneuf, B., McDonough III, J.J. and P. Etnoyer, in press. "Occurrence of deep-water *Lophelia pertusa* and *Madrepora oculata* in the Gulf of Mexico." In, 'Deep-Water Corals and Ecosystems', Freiwald, A. and Roberts, M.J. eds., Springer Publishing, Heidelberg. Proceedings of the 2nd International Symposium on Deep-Sea Corals, Sept 8-13, Erlangen, Germany.
- Sulak, K. pers. comm. Presentation to the House Oceans Caucus and NMFS March 14, 2003, background materials. Available upon request.

IV. Deep-Sea Coral and Sponge Habitats Satisfy the Definition of EFH

Deep-sea coral and sponge species found throughout the country are often associated with other seafloor habitat-forming animals like anemones, crinoids, and bryozoans. Whether solitary, in small communities, or in large reef-like complexes, these species serve important ecological functions by acting as complex structural habitat to fish, invertebrates, and other species living in the deep-sea. Therefore, these deep-sea coral and sponge habitats meet the definition of EFH as "waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" under 16 USC §1802(10) and 50 CFR §600.10.

A. Deep-Sea Coral and Sponge Habitats Are EFH Because They Are "Waters" and "Substrate"

Deep-sea coral and sponge habitats meet the definition of "waters" because they are "aquatic areas and their associated physical, chemical and biological properties [are] used by fish" *(see*, e.g., Reed 2002a, Reed 2002b, Fossa *et al.* 2002, Krieger and Wing 2002). More fundamentally, they are also "substrate", because they are "hard-bottom, structures underlying the waters, and associated biologically communities" pursuant to 50 CFR §600.10.

B. Deep-Sea Coral and Sponge Habitats Are EFH Because They Are Necessary to Fish for Spawning, Breeding, Feeding or Growth to Maturity

Deep-sea coral and sponge habitats are "necessary" because they "support a sustainable fishery and the managed species' contribution to a healthy ecosystem," satisfying the definition set forth at 50 CFR §600.10. Fish are attracted to coral communities to enhance their feeding opportunities, to hide from predators, and for their use as nursery areas (Husebo *et al.* 2002, Krieger and Wing 2002). These functions are crucial to individual species' survival and the long-term sustainability of fish populations and fisheries.

In the North Pacific, rockfish, Atka mackerel, walleye pollock, Pacific cod, Pacific halibut, sablefish, flatfish, crabs, and other economically important fish and shellfish species inhabit areas of deep-sea coral, sponge, and other habitat-forming structures. In Alaska, flatfish are commonly found around sea squirts and bryozoans; cod are found around sea anemones, sea pens, and sea whips; rockfish and Atka mackerel are found around sponges; crabs are found around sea squirts; and other commercial fish species such as sablefish and skates are found around sea pens and sea whips (Malecha *et al.* 2002). Eighty-three percent of the rockfish found in one study were associated with red tree coral in the Gulf of Alaska (Krieger and Wing 2002). Studies have found flatfish, walleye pollock, and Pacific cod commonly caught around soft corals in Alaska (Heifetz 2002). Juvenile and adult species of rockfish, sea stars, nudibranchs, crinoids, basket stars, crabs, shrimp, snails, anemones, and sponges use the coral polyps of deep-sea gorgonian coral in the North Atlantic and North Pacific for food throughout their life cycle (Krieger and Wing 2002).

In the waters off Florida, the dense and diverse Oculina Banks community supports large numbers of fish, forming breeding grounds for gag and scamp grouper, nursery grounds for young snowy grouper, and feeding grounds for many other valuable fish including bass, other groupers, jacks, snappers, porgies, and sharks. Large populations of the commercially important squid, *Illex oxygonius*, have also been observed spawning on these reefs (Reed 2002b).

Deep-sea coral and sponge reefs host dense invertebrate communities, upon which diverse populations of fish species feed. *Lophelia* reefs, associated with large habitat forming invertebrates, such as massive sponges and gorgonians, support high levels of marine-invertebrate biodiversity and commercially-valuable fish populations. Researchers found that commercially-valuable fish species aggregate on deep-sea *Lophelia* coral reefs in Norway, and that fish caught in coral habitats tended to be larger than fish caught in non-coral habitats (Husebo *et al.* 2002).

Because deep-sea coral and sponge habitat in regions throughout the country are waters and substrate, and are necessary to fish for many crucial functions, coral and sponge habitats meet the definition of EFH set forth at 16 USC §1853(a)(7) of the Magnuson-Stevens Act.

V. Deep-Sea Coral and Sponge Habitats Should Be Identified for Possible Designation as HAPC

Deep-sea coral and sponge habitats are exceptionally vulnerable to fishing activities, in particular the destructive effects of bottom trawling and other bottom-tending mobile gears. *See* Section VI. C and D, *infra pp14-17.* All FMPs must contain an evaluation of the potential adverse effects of fishing on EFH and "should identify for possible designation as HAPC any EFH that is particularly vulnerable to fishing activities." 50 CFR 600.815(a)(2)(i). Therefore, deep-sea coral and sponge habitat should be identified for possible designation as HAPC.

VI. Deep-Sea Coral and Sponge Habitats Satisfy the Definition of HAPC

Deep-sea coral and sponge habitats satisfy the definition of habitat areas of particular concern. NOAA has already designated some deep-sea coral and sponge habitat as HAPC in the North Pacific and South Atlantic. Moreover, coral and sponge habitats also satisfy all four criteria set forth at 50 CFR §600.815(a)(8), because they: (1) provide important ecological functions; (2) are extremely sensitive to human-induced environmental degradation; (3) are stressed by development activities; and (4) are a rare habitat type.

A. Deep-Sea Coral and Sponge Habitats Are Recognized as HAPC by NOAA

Deep-sea coral and sponge habitat have been designated by NOAA as HAPC in the North Pacific and off the coast of Florida. In recognizing the importance of coral and sponge habitat in the North Pacific, NOAA has stated that, “coral, sponges, and other living substrata in waters off Alaska already are classified by NOAA Fisheries as Habitat Areas of Particular Concern deserving of special protection because of their importance as habitat and their vulnerability to human impacts.” Letter from Dr. William Hogarth, Assistant Administrator of Fisheries, NOAA, to Jim Ayers (Sept. 9, 2002). *See* 64 Fed. Reg. 20216 (Apr. 26, 1999). The Oculina Banks, off the coast of Florida, are also designated as HAPC. 49 Fed. Reg. 29607 (July 23, 1984) (codified at 50 CFR pt. 638, consolidated into 50 CFR pt. 622); 59 Fed. Reg. 27242 (May 26, 1994) (designating the Oculina Experimental Closed Area).

Alaska and the Oculina Banks are arguably the best studied regions of the EEZ with respect to deep-sea corals. It is no coincidence that the better understanding of the communities in these areas has resulted in the realization of their importance both economically and ecologically. NOAA must act quickly to not only designate, but also to protect, known coral and sponge areas in these and other regions as HAPC, and identify and protect other areas for potential HAPC designation before these areas are destroyed.

B. Deep-Sea Coral and Sponge Habitats Provide Important Ecological Functions

Coral species create communities of complex habitats that support extremely high levels of species richness and biological diversity (Reed 2002a, Freiwald 2002), and therefore provide important ecological functions, such as feeding, breeding, and protection. Therefore, they satisfy the first HAPC criterion. 50 CFR §600.815(a)(8)(i).

Deep-sea coral communities often exhibit high levels of species diversity and contain great numbers of managed species. *Lophelia* provides habitat for animals such as sponges, anemones, bryozoans, gorgonians, worms, fish, mollusks, and crustaceans (Rogers 1999). Scientists have recorded more than 1300 species living on or in *Lophelia* reefs in the northeast Atlantic (Roberts *et al.* 2003). The *Lophelia* reefs on the western edge of the Blake plateau, off the coast of South Carolina and Georgia, support large populations of massive sponges and gorgonians in addition to smaller, less studied macroinvertebrates (Reed 2002a). On the western edge of this plateau, there is an abundance of hydroids, soft corals, echinoderms, actinaria, and ophiuroids. Such diversity, comparable in numbers to some shallow water reefs and seen also in the Oculina Banks (Reed 2002a), is also one reason that the reefs are important feeding, breeding, and nursery grounds for commercially important fish populations.

Deep-sea corals' complex structure serves as important habitat for protecting both juvenile and adult fish. Ten megafaunal groups have been associated with *Primnoa* spp., a deep-water gorgonian coral found in the North Atlantic and North Pacific that grows in a branching tree reaching some 3 meters from the seabed. Organisms including rockfish, sea stars, nudibranchs, crinoids, basket stars, crabs, shrimp, snails, anemones, and sponges use coral habitat for protection as well as food. Diverse species of shrimp, crabs, and rockfish also seek protection among the coral and coral polyps. Shortraker, rougheye, and redbanded rockfish have been documented beneath the corals, while sharpchin and juvenile yelloweye rockfish were among corals, and dusky rockfish were sighted above the corals (Krieger and Wing 2002).

Research has demonstrated that the destruction of deep-sea coral and sponge communities may alter the ecosystems in which they thrive. For example, researchers in the North Pacific have identified *Primnoa* spp. as both important habitat and a source of prey species for fish and invertebrates. The removal of or damage to the *Primnoa* communities may affect the populations of associated species, especially at depths greater than 300 meters, where species depend on *Primnoa* almost exclusively (Krieger and Wing 2002). On a larger scale, because *Primnoa* are important components of the deep-water ecosystem, the removal of these slow-growing corals could cause long-term changes in associated megafauna (Krieger and Wing 2002).

Additionally, researchers have found that species diversity is about three times higher on *Lophelia* reefs in the Northeast Atlantic than in the surrounding soft bottom habitat (UK Biodiversity Group 1999). Extensive *Lophelia* reefs have also recently been discovered in deep-waters in the Gulf of Mexico and off North Carolina (Sulak 2003). Studies show that anthropogenic alteration of a significant portion of *Lophelia* communities may dramatically change the distribution of species diversity along the whole shelf and slope (Fossa *et al.* 2002).

These examples demonstrate that deep-sea coral and sponge communities provide important ecological functions, and therefore constitute HAPC under 50 CFR §600.815(a)(8)(i). They are essential, indeed irreplaceable, components of their ecosystems, upon which thousands of fish and invertebrates depend for feeding, breeding, and protection. If these communities are disrupted or destroyed, the ecological services that they provide will vanish.

C. Deep-Sea Coral and Sponge Habitats Are Extremely Sensitive to Human-Induced Environmental Degradation

Deep-sea coral and sponge habitat are extremely sensitive to human-induced environmental degradation, satisfying the second HAPC criterion set forth at 50 CFR §600.815(a)(8)(ii).

Heavy fishing gear, like bottom trawls, directly kills corals, breaks up reef structure, or buries corals through increased sedimentation (Rogers 1999). Coral not directly destroyed can be killed by infections through wounds in coral tissue (Fossa *et al.* 2002).

Until recently, the biology and ecology of deep-sea corals has been largely unknown, primarily because the corals are found out of sight of humans and in ocean habitats where scientific research is difficult. However, as new threats from trawling emerge, scientists have begun to examine coral and sponge species and the communities they support. Because deep-sea corals are extremely slow growing and build fragile, complex structures, physical alteration of their environments can be extremely harmful and long lasting. Researchers have documented that bottom-tending mobile fishing gear can destroy deep-sea corals with a single trawl (Krieger 2001), and that the recovery of these communities may take hundreds or even thousands of years (Fossa *et al.* 2000 and see information on coral longevity/growth rates below).

A 2001 report on cold-water corals from the Advisory Committee on Ecosystems for the International Council for the Exploration of the Sea stated that the loss of structure-forming organisms caused by bottom trawling may be permanent and can lead to an overall loss of habitat diversity. This loss, in turn, can lead to the local loss of species and species assemblages dependent upon the biological structures. The report further explained that even if the features remain in a fragmented form, the viability of species populations may be compromised (ICES 2001).

The long-lived and slow-growing characteristics of cold-water coral reefs make them especially vulnerable to human-induced degradation (ICES 2001). Specific examples are described below.

- *Oculina varicosa* has an estimated average growth rate of about 1.6 cm a year. At this rate a 1.5 meter high colony may be nearly 100 years old. The *Oculina* reefs off the coast of central eastern Florida, with a maximum height of 25 meters, are estimated to have a minimum age of 1,526 years (Reed 2002a).

- *Lophelia pertusa* has a growth rate of 4-25 mm a year (Rogers 1999). Off Norway, a dying *Lophelia* reef, about 10 meters thick, was estimated to be between 526 and 2,500 years old (Reed 2002a). It would take hundreds of years to build a colony 5-6.5 meters in diameter, and thousands of years to build a reef structure 10-33 meters thick. Thus, recovery of these communities to regain their ecological functions would take in the order of hundreds to thousands of years (Fossa *et al.* 2002).

- *Primnoa* spp. has a life span of more than 100 years, with a growth rate of approximately 13 mm per year in Alaska (Andrews *et al.* 2002). In 1998, using isotope dating, researchers estimated a 5 cm diameter specimen was about 500 years old (Heikoop *et al.* 1998, cited in Krieger 2001).

- *Paragorgia arborea*, found on both coasts of North America, has been estimated to grow for at least 300-500 years in New Zealand waters (Tracey *et al.* 2003).

- *Keratosis sp.*(bamboo coral), found off the Pacific coast of North America, has been estimated to reach 100-500 years old in New Zealand and Australian waters (Tracey *et al.* 2003).

- The longevity of two other reef-building deep-water corals, *Madrepora oculata* and *Enallopsammia rostrata*, ranges from 200-6000 years (New Zealand waters) and 600-5000 years (North Sea) (Tracey *et al.* 2003). *E. rostrata* is found associated with *Lophelia* reefs in United States waters (Reed 2002a), and *M. oculata* is found in deep waters in the Gulf of Mexico (Schroeder et al. in press).

Sponge communities, often associated with deep-sea corals in the North Pacific, are also extremely sensitive to human-induced degradation from bottom trawling. Sponges can suffer immediate declines through direct removal and further reductions in population densities due to delayed mortality. The damage caused to sponges on the continental shelf break may persist for extended periods of time (Freese 1999). Due to their longevity and slow growth, coral and sponge habitats are extremely sensitive to human-induced environmental degradation and therefore constitute HAPC under 50 CFR §600.815(a)(8)(ii).

D. Deep-Sea Coral and Sponge Habitats Are Stressed by Development Activities

Deep-sea coral and sponge habitats are stressed by development activities such as bottom trawling. Therefore, they satisfy the third HAPC criterion. 50 CFR §600.815(a)(8)(iii). The expansion of fishing fleets into deep-sea environments for the first time has drastically increased anthropogenic threats to deep-sea ecosystems. Deepwater trawlers now operate to depths of 2,000 meters (Freiwald 2002), and use new technologies, more powerful engines, and gear such as rockhoppers that allow fishing in areas that were once avoided or inaccessible (Koslow *et al.* 2001). In fact it is precisely because fish species aggregate around them that deep-sea coral and sponge habitats are targeted and at risk from destructive fishing practices (Dr Jason Hall-Spencer, quoted in Clarke 2002). Fishermen know that areas with deep-sea corals are good fishing grounds (Fossa *et al.* 2002, and Breeze 1997), and set their gear for different species of fish depending upon the type of coral in the area (Lees 2002).

In fact, destructive fishing practices are the most widespread anthropogenic threat to deep-sea coral and sponge communities. Deep-sea coral and sponge habitats are increasingly imperiled as bottom-tending mobile fishing gear, such as bottom trawls and dredges, flatten these sensitive communities and move further offshore onto the continental slope and into deep-sea canyons, and onto seamounts. The National Academy of Sciences recently found that living habitats such as coral and sponge communities are among the most heavily damaged and the slowest to recover from trawling (NRC 2002).

Bottom trawling and dredging have caused severe mechanical damage to deep-sea *Lophelia* reefs in the Northeast Atlantic, hard-bottom habitats off the Southeastern United States, and deep-water seamounts off New Zealand and Tasmania (Fossa *et al.* 2002, Hall-Spencer *et al.* 2001, Reed 2002b, Koslow *et al.* 2001). In Alaskan waters, NMFS estimates that over one million pounds of deep-sea corals and sponges were removed annually during1997-99 from the seafloor by commercial fishing; more than 90 percent by bottom trawlers (NMFS 2003a).

Research in the Gulf of Alaska demonstrates that a single pass of a bottom trawl can displace boulders and remove or damage large epifaunal invertebrates (Krieger 2001). In addition, the use of bottom trawls with rollers and tickler chains can decimate fragile corals like *Oculina* (Reed 2002b).

After fishing gear is dragged through deep-sea communities, corals not crushed or buried may be harmed indirectly by the disturbance. Corals still standing may have cuts in their tissues that can lead to microbial infections (Fossa *et al.* 2002). Increased sediment loads from the pass of a bottom trawl or dredge can impede the growth of the coral, kill it by smothering, or prevent recolonization by coral larvae (Reed 2002b). All of these indirect impacts reduce coral health.

Bottom trawls are not the only fishing gear that damages deep-sea corals. Longline gear, consisting of miles of fishing line with attached lines to hooks or pots, and gillnetting gear anchored on the bottom with heavy weights, have been observed snagging, covering and damaging deep-water coral (Sulak 2003, Fossa *et al.* 2002). Anchors dropped and dragged along the seafloor can destroy coral communities, as they have done in fragile *Oculina* coral communities (Reed 2002b). Similarly, fishing traps placed on or near the reefs risk damaging hard and soft corals, while weighted bottom longline and hook and line gear, targeting deep-water species, may entangle corals and break fragile branching species. Researchers in submersibles have witnessed fishing lines entangled over deep-water *Oculina* reefs (Reed 2002b). Fewer than 30 years after the discovery of the unique *Oculina* coral banks off the coast of Florida, fewer than 20 acres of intact reef habitat remains (Koenig 2001).

For these reasons, deep-sea coral and sponge habitats are stressed by development activities, especially bottom trawling, and therefore constitute HAPC under 50 CFR§600.815(a)(8)(iii).

E. Deep-Sea Coral and Sponge Habitats Are Rare Habitat Types

At least some deep-sea coral and sponge habitats are rare habitat types. Therefore, they satisfy the fourth HAPC criterion. 50 CFR §600.815(a)(8)(iv).

The Oculina Banks in the Atlantic off Florida are thought to be unique (Koenig 2001). Deep-water coral reefs and other potential hard-bottom communities not associated with chemosynthetic communities appear to be very rare in deep-water in the Gulf of Mexico (MMS 2000).

Complete, fine-scale maps of deep-water coral habitat in most United States waters are not yet available. However, broad-scale substrate mapping has been completed for much of the East Coast continental shelf and slope. As one of the habitat requirements of most deep-sea corals is a hard substrate, we can use these broad-scale substrate maps as proxies for the maximum likely deep-water coral coverage in the map area. Figure 11 shows the rarity of hard substrates based on broad-scale sampling off the Atlantic Coast (Poppe and Peloni, 2000, in NRC 2002). Of course, deep-water corals have many other habitat requirements (such as specific ranges in temperature, salinity, current flow), so our proxy will almost certainly overestimate the amount of coral, possibly by a very large margin.

For these reasons, at least some deep-sea coral and sponge habitats are rare habitat types, and therefore constitute HAPC under 50 CFR§600.815(a)(8)(iv).

* * *

NOAA has already recognized deep-sea coral and sponge habitat as HAPC in the North Pacific and the Oculina Banks. Other deep-sea coral and sponge habitat also meet the definition of HAPC under NOAA guidelines because they provide important ecological functions, are extremely sensitive to human-induced environmental degradation, are stressed by development activities such as destructive fishing practices, and are a rare habitat type. 50 CFR §600.815(a)(8)(i)-(iv).

VII. The Secretary Must Protect Deep-Sea Coral and Sponge Habitat Designated as EFH and HAPC

As shown above, deep-sea coral and sponge habitats are waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity, and therefore constitute EFH under 16 USC §1802(10). *See supra* pp.10-11, section IV. Deep-sea coral and sponge habitats also constitute HAPC under 50 CFR §600.815(a)(8), because they provide important ecological functions, are extremely sensitive to human-induced environmental degradation, are stressed by development activities like bottom trawling, and are (at least some of them) rare. *See supra* pp.12-18, section VI. Deep-sea coral and sponge are also "particularly vulnerable to fishing activities" within the meaning of 50 CFR §600.815(a)(2)(i). *See supra* pp.14-17, section VI.C-D. Therefore, the Secretary must take action to identify and protect deep-sea coral and sponge habitat. Moreover, because deep-sea corals and sponges are "fish" within the definition of the Magnuson-Stevens Act, they must be protected for their own sake.

A. The Magnuson-Stevens Act Requires NOAA to Identify and Protect EFH/HAPC

The Magnuson-Stevens Act requires that FMPs not only describe and identify EFH/HAPC, but also that FMPs "minimize to the extent practicable adverse effects on such habitats caused by fishing." 16 USC §1853(a)(7). FMPs must evaluate the potential adverse effects of fishing on EFH, including the cumulative effects of multiple fishing activities, giving "special attention" to adverse effects on HAPC. 50 CFR §600.815(a)(2)(i). The Councils, and the Secretary in the Councils' absence, "must act to prevent, mitigate, or minimize any adverse effects from fishing on EFH/HAPC to the extent practicable, if there is evidence that fishing activities adversely affect EFH in a manner that is more than minimal and not temporary in nature." 50 CFR §600.815(a)(2)(ii).

Numerous studies show that fishing practices are destroying deep-sea coral and sponge habitats that are hundreds or thousands of years old. *See supra* pp.14-17, section VI.C-D. Therefore, the adverse effects of fishing on coral and sponge habitats are "more than minimal and not temporary in nature" and must be prevented, mitigated, or minimized. 50 CFR §600.815(a)(2)(ii).

To address the adverse impacts on EFH, FMPs "should identify a range of potential new actions that could be taken … and adopt any new measures that are necessary and practicable." 50 CFR §600.815(a)(2)(ii). "Adverse effects" are defined as "any impact which reduces quality and/or quantity of EFH," including "physical disruption." *Id*. §600.810(a). NOAA must assist the Councils in identifying adverse impacts to EFH/HAPC and actions to ensure the conservation and enhancement of EFH/HAPC for each FMP. *Id.* §600.815(b).

Options for managing adverse effects on EFH/HAPC include, but are not limited to, "prohibitions on fishing activities that cause significant damage to EFH," *id.* §600.815(a)(2)(iv)(A), "closing areas to all fishing or specific equipment types," and "designating zones for use as marine protected areas to limit adverse effects of fishing practices on certain vulnerable or rare areas/species/life stages, *such as those areas designated as habitat areas of particular concern*," *id.* §600.815(a)(2)(iv)(B) (emphasis added). The most effective way for NOAA to ensure that deep-sea coral and sponge EFH/HAPC are protected from destructive fishing practices is by closing such areas to bottom trawling.

Furthermore, it should be noted that the duty to minimize adverse effects on EFH does not require proof of effects on the productivity of managed species. Consideration of the productivity of commercial species should not be required when creating provisions to minimize adverse effects on EFH. This consideration is not set out in the statute or in the regulations and is counter to the published preamble to the EFH final rule (67 FR 2354) which states, "It is not appropriate to require definitive proof of a link between fishing impacts to EFH and reduced stock productivity before Councils can take action to minimize adverse fishing impacts to EFH to the extent practicable. Such a requirement would raise the threshold for action above that set by the Magnuson-Stevens Act." Requiring a link to productivity is anti-precautionary and establishes an unrealistic data requirement that would result in little to no habitat protection due mainly to the paucity of this type of data. Deep- or cold-water corals and sponges are a good example of the importance of following the original text of the regulations. Their geographic and bathymetric locations tend to make studying them particularly difficult, and so data on their importance specifically to managed fish species is still being collected.

B. The Protection of EFH/HAPC Is Practicable

NOAA must protect deep-sea coral and sponge EFH/HAPC, because measures to minimize the adverse effects of fishing on these habitats are practicable. In considering whether measures to minimize the adverse effects of fishing on essential fish habitat are "practicable," the guidelines provide that:

> Councils should consider the nature and extent of the adverse effect on EFH and the long and short-term costs and benefits of potential management measures to EFH, associated fisheries and the nation, consistent with national standard 7. In determining whether management measures are practicable, Councils are not required to perform a formal cost/benefit analysis. 50 CFR §600.815(a)(2)(iii).

National Standard 7 provides that "conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication." 16 USC §1851(a)(7). The costs of closing deep-sea coral and sponge habitat to bottom-tending mobile fishing gear are minimal, especially in view of the long-term benefits, and the measures requested to protect these habitats are not duplicated in other processes. In fact it is the lack of protection for these habitats that necessitates the filing of this petition.

Considering their importance to many marine species, including commercially valuable species (*see supra* pp.4-10 and 12-14, sections III and VI.B), the long term benefits likely far outweigh any short-term costs of protecting coral and sponge HAPC. These long-term benefits far outweigh Closing coral and sponge habitats that are infrequently fished to destructive fishing practices, such as bottom trawling, imposes little costs to the industry, especially in view of fishing industry claims that vessels do not frequently fish in coral and sponge habitat *(see,* e.g., Jerry Schill, Executive Director of the North Carolina Fisheries Association Inc. quoted in “Trawling blamed for loss of corals”, A8 Final Edition, Washington Times, July 15, 2003, and John Gauvin, Director of the Groundfish Forum, speaking at the Symposium On Effects Of Fishing Activities On Benthic Habitats: Linking Geology, Biology, Socioeconomics And Management, Tampa, Florida, November 14, 2002 <is there a transcript avail.?).

Closing coral and sponge HAPC that are more frequently fished also has long-term benefits that outweigh short-term costs, because fisheries outside coral and sponge areas benefit from the protection of essential fish spawning, breeding, and feeding areas. Such protected areas have demonstrated spill-over effects that benefit adjacent commercial and recreational fishing (Roberts 2001, Gell and Roberts 2003).

The practicability of closing deep-sea coral and sponge habitats to bottom-tending mobile fishing gear has also been demonstrated by the recent adoption of similar measures in other jurisdictions. For example, the Norwegian Ministry of Fisheries closed an area of more than 1000 square km at Sula in 1999. Since then, the ministry has closed four other reef areas to fishing. The latest, Tisler reef on the Norway/Sweden border, was discovered in the summer of 2002, and closed in June 2003. The European Commission announced that it has also closed deep-sea coral areas on the Darwin Mounds, off the coast of Scotland, to bottom trawling gear on August 21, 2003. In addition, New Zealand has protected 19 seamounts from trawling as part of its ongoing research program.

The legislative history of the Magnuson-Stevens Act recognizes that by using “practicable,” Congress established a very strong mandate, one synonymous with the mandate to avoid or minimize bycatch where “possible.” *See, e.g.,* 141 Cong. Rec. H10,225 (Statement of Rep. Farr) (daily ed. Oct. 18, 1995). *See also* Black’s Law Dictionary 1172 (6th ed. 1991) (defining “practicable” as “that which may be done, practiced, or accomplished; that which is performable, feasible, possible.”).

Case law shows that “impracticability” is a rigorous test. As noted in the regulations, and confirmed in the courts, the term “practicable” rejects a cost-benefit standard in which mere economic cost can be the basis for rejecting an alternative. *See American Textile Mfrs. Inst., Inc. v. Donovan*, 452 United States 490, 514 (1981) (interpreting use of “practicable” synonym “feasible”). Therefore, even if the agency’s analysis determines that a habitat-protection measure is more costly in the short- and long-term, that alone is not a sufficient basis to reject a measure as impracticable. *Id*. at 514 ("Congress was fully aware that the Act would impose real and substantial costs of compliance on industry."); *United Steelworkers of America, AFL-CIO-CLC v. Marshall*, 647 F.2d 1189, 1265 (D.C. Cir. 1980) (citation omitted) (a standard is not economically infeasible because it is "financially burdensome" or even if it "threatens the survival of some companies within an industry"). *See also Friends of Boundary Waters Wilderness v. Thomas*, 53 F.3d 881, 885 (8th Cir. 1995) ("feasible" means physically possible.) *But cf. Conservation Law Foundation v. Evans*, 2004 WL 350626 at * 5 (1st Cir. 2004) ("We think by using the term "practicable" Congress intended rather to allow for the application of agency expertise and discretion in determining how best to manage fishery resources.").

Case law from other statutes confirms that the agency must make a very strong showing to conclude that a measure is impracticable. The term "practicable" is used in the Clean Water Act to require conservation measures to be taken unless the benefit is "wholly out of proportion to the costs . . . ." *Weyerhaeuser Co. v. Costle*, 590 F.2d 1011, 1045 n.52 (D.C. Cir. 1978); *see also Rybachek v. EPA*, 904 F.2d 1276, 1289 (9th Cir. 1990); *Association of Pacific Fisheries v. EPA.*, 615 F.2d 794, 805 (9th Cir. 1980). The Endangered Species Act requirement to take certain actions "to the maximum extent practicable," does not give the agency "unbridled discretion;" rather it "imposes a clear duty on the agency to fulfill the statutory command to the extent that it is feasible or possible." *Fund for Animals v. Babbitt*, 903 F. Supp. 96, 107 (D.D.C. 1995), *opinion amended per settlement agreement by* 967 F. Supp. 6 (D.D.C. 1997).

The plain language of the Magnuson-Stevens Act, its legislative history, NOAA's own regulations, and case law interpreting the term "practicable," all show NOAA's paramount duty to protect coral and sponge habitat by designating such areas as EFH/HAPC and closing it to bottom trawling and other destructive fishing practices.

C. Deep-Sea Coral and Sponge Habitat Must Be Protected for Its Own Sake

The Secretary is required by law to protect deep-sea coral and sponge habitat for its own sake, even if the Secretary does not act on the abundant evidence that deep-sea coral and sponge habitat is crucial for many other organisms in the marine ecosystem. Under the Magnuson-Stevens Act, the term "fish" means "all . . . forms of marine animal and plant life other than marine mammals and birds." 16 USC §1802(12). The term "fishery" means, *inter alia* "one or more stocks of fish." *Id.* §1802(13). Thus corals and sponges are fish that constitute fisheries within the meaning of the Act.

If the Secretary does not protect coral and sponge habitat through existing FMPs, the Magnuson-Stevens Act requires the Secretary and the Councils to promulgate FMPs specifically for the protection of corals and sponges. The Act directs each regional council to prepare a fishery management plan for "each fishery under its authority that requires conservation and management." 16 USC §1852(h). "[C]onservation and management "refers to all . . .measures . . . which are required to . . . maintain . . . any fishery resource . . . and are designed to ensure that . . . irreversible or long-term adverse effects on fishery resources and the marine environment are avoided." *Id.* §1802(5). As this petition makes clear, measures are needed to maintain coral and sponge habitat and prevent irreversible adverse effects. *See supra* pp.12-18, section VI. If those measures are not promulgated in existing FMPs, the Councils are required to issue coral and sponge-specific FMPs, pursuant to §1852(h). If the Councils do not fulfill their obligation, then the Secretary must step in pursuant to his statutory authority. *Id.* §1854(c).

If coral and sponge FMPs are promulgated, the FMPs must designate coral and sponge habitat as EFH/HAPC for the corals and sponges themselves. The Magnuson-Stevens Act requires the Secretary to protect structure-forming habitat essential for all fish, and it could not be more clear that corals and sponges create their own substrate which is "necessary … for spawning, breeding, feeding or growth to maturity." *Id.* § 1802(10) *(See supra* pp.10, sections IV and V).

In sum, there is abundant evidence for the Secretary to protect coral and sponge habitats as EFH and HAPC for many other species. Furthermore, there is an even more direct argument for protecting these habitat-forming organisms, because they form their own EFH/HAPC. Therefore, the Magnuson-Stevens Act requires the Councils and the Secretary to promulgate coral and sponge FMPs to protect coral and sponge habitats if these habitats are not protected in other FMPs.

VIII. Actions Requested

The Secretary of Commerce, acting through NOAA, is authorized to act in emergencies to prevent serious damage to fishery resources or habitat. 16 USC § 1855(c)(1), and 62 Fed. Reg. 44421 (August 21, 1997). Deep-sea coral and sponge EFH/HAPC is in imminent peril from bottom trawling and other destructive fishing practices. Therefore the Secretary must act immediately under his emergency authority to designate and protect deep-sea coral and sponge habitat from bottom trawling. The Secretary is also authorized to permanently protect deep-sea coral and sponge EFH/HAPC if the Councils fail to adopt permanent protections. 16 USC §1854(c)(1)(A)-(C). Since the Councils are failing to take actions to protect these sensitive and vital habitats, the Secretary must also prepare FMP and FMP amendments to identify and protect deep-sea coral and sponge habitat as EFH/HAPC where the Councils have failed to adopt permanent protections.

Emergency regulations can only remain in effect for two-180 day periods, 16 USC §1855(c)(3)(B). Therefore, the Secretary should allow regional councils to initiate rulemakings to permanently protect deep-sea coral and sponge habitats. To provide sufficient notice and comment to adopt FMPs or amendments to protect EFH/HAPC permanently, before the expiration of the emergency rule, the Secretary must give the

Councils the opportunity to submit FMP amendments within 9 months of the promulgation of the emergency rule. *See* 16 USC §1854(c)(1)(A). If the Councils fail to act within 9 months of the promulgation of the emergency rule, the Secretary must immediately issue his own proposed amendment to protect coral and sponge habitat, so that there is no lapse in protection that could allow these special areas to be devastated by destructive fishing activities. *See* 16 USC §1854(c)(4) and (7).

A. The Secretary Must Use His Emergency Authority to Designate and Protect Deep- Sea Coral and Sponge Habitat as EFH and HAPC

There is an urgent need for the Secretary of Commerce to act immediately to designate and protect deep-sea coral and sponge habitat as EFH and HAPC pursuant to his emergency authority under 16 USC § 1855(c)(1), and 62 Fed. Reg. 44421 (August 21, 1997). The Magnuson-Stevens Act authorizes the Secretary to act in emergencies "without regard to whether a fishery management plan exists for such fishery." *Id.* Normal rulemaking procedures would leave these recently-discovered, vital, and vulnerable resources at-risk indefinitely. Therefore the Secretary must immediately use his emergency powers to protect these resources while they still exist.

NOAA guidelines define emergencies as situations that: (1) result from recent, unforeseen events or recently discovered circumstances; (2) present serious conservation or management issues; and (3) can be addressed through emergency regulations for which the immediate benefits outweigh the value of advance notice, public comment, and deliberate consideration of the impacts on participants. 62 Fed. Reg. 44422 (August 21, 1997). Emergency actions are justified if the time it takes to complete notice-and-comment would result in substantial damage or loss to a living marine resource, habitat or fishery, and the emergency action is needed to prevent "serious damage to the fishery resource or habitat." *Id.* The emergency protection of coral and sponge habitat from bottom trawling and other destructive fishing practices is warranted under the Magnuson-Stevens Act and each of the criteria set forth at 62 Fed. Reg. 44421 (August 21, 1997).

1. The Secretary May Adopt Emergency Rules to Address "recent, unforeseen events or recently discovered circumstances." Criteria 1 under 62 Fed. Reg. 44422 (August 21, 1997).

Scientists have only recently discovered the existence of many deep-sea coral and sponge habitats, and the continued damage to these habitats from fishing gear has also only recently been discovered. Thus, the Councils were largely unaware of the existence of these important habitats when developing FMPs. Recent and unfolding discoveries of deep-sea coral and sponge communities and the advent of new technologies that threaten the destruction of these communities, has created an emergency that requires immediate action by the Secretary *(see*, e.g., Goad 2002, Heifetz 2002, NOAA 2002a, 2002b, 2002c, NOAA 2003 Ocean Explorations in New England, Alaska, and the Gulf of Mexico, Sulak 2003).

With new technology, larger boats, and roller and rockhopper gear, fishermen have dramatically expanded the amount and types of habitats bottom trawled (Freiwald 2002, Koslow *et al.* 2001). Over the past decade, bottom trawling has directly affected about 600,000 square km of seafloor habitat off the United States (NRC 2002), an area larger than the state of California. Action is urgently needed to prevent these proliferating activities from destroying extremely valuable and long-lived coral and sponge communities.

NOAA is currently preparing five regional EFH EISs required by the Court's ruling in *American Oceans Campaign v. Daley*, 183 F. Supp. 2d 1 (2000), and pursuant to schedules laid out in a series of Joint Stipulations developed by the parties to the litigation and entered by the court. Oceana and the other plaintiffs are participating actively in those public processes. These processes have already advanced to the draft EIS stage without having had the opportunity to take into account the new data on deep-sea corals and sponges. Most of these processes have timetables that would not easily allow the EISs and resulting rules to take into account this newly-understood need to protect these special deep-sea habitats. Moreover, rules adopted to protect deep-sea coral and sponge EFH/HAPC, if they come out at all, are unlikely to take effect sooner than 2005-2006 (see, e.g., HAPC designations for the NPFMC EFH EIS not due earlier than 2006, 68 Fed. Reg. 50120, August 20, 2003). It is imperative, therefore, that the Secretary act immediately under his emergency authority to protect known coral and sponge habitat from destructive fishing practices before these special biological communities are irreparably harmed. As noted in the *AOC v. Daley* ruling, the Councils, and the Secretary in the absence of Council action, "must adopt practical mitigating measures if there is evidence that a fishing practice is having an identifiable adverse effect on EFH." *Id.* at 13. Fishing practices *are* having identifiable adverse impacts on coral and sponge habitat. *See supra* pp.14-17, section VI.C-D. Therefore, the Secretary must protect these sensitive habitats immediately to address "recent, unforeseen events or recently discovered circumstances." 62 Fed. Reg. 44422 (August 21, 1997).

2. The Secretary May Adopt Emergency Rules to Address "serious conservation or management problems" in a Number of Fisheries.

The impact to deep-sea coral and sponge habitat from bottom trawling is a serious conservation and management problem. NOAA estimates that in Alaska alone, over one million pounds of corals and sponges were removed from the seafloor each year between 1997 and 1999, roughly 90 percent by bottom trawlers (NMFS 2003a). This estimate does not even include the damage caused by trawl doors, rockhoppers, and other gear that damage and crush corals and sponges but do not pull them to the surface to be counted by observers. These slow-growing species can take decades or centuries to recover from damage, if they recover at all, eliminating essential habitat for many fish species and reducing biodiversity in critical ocean areas.

The destruction of deep-sea coral and sponge habitat substantially harms fish and ocean resources. Studies show the dependence of fish on *Oculina* and *Lophelia* reefs in the waters off the Southeast United States and the Gulf of Mexico, the dependence of myriad other species on North Pacific coral and sponge communities, the important ecological functions provided by deep-sea coral and sponge habitat, and the serious conservation and management problems posed by destructive fishing practices. *See supra* pp.10-18, sections IV and VI. Therefore the Secretary must use his emergency rulemaking authority to address this "serious conservation or management problem." 62 Fed. Reg. 44422 (August 21, 1997).

3. The Benefits for Addressing Impacts Through Emergency Rules Outweigh the Value of Advance Notice, Public Comment and the Deliberative Consideration of the Impacts on Participants Through Normal Rulemaking.

The threat to coral and sponge habitat is immediate and urgent: just one pass by a bottom trawl can create devastating damage to these sensitive and long-lived species. NOAA guidelines provide that emergency actions may be taken, "where substantial harm to or disruption of the resource, fishery or community would be caused in the time it would take to follow standard rulemaking procedures." 62 Fed. Reg. 44421 (August 21, 1997). The possible consequences of the destruction of these habitats to fisheries and the ocean ecosystem (also, *see* s*upra* pp.10-11, sections IV and V) are so severe that the Secretary must act immediately to protect known coral and sponge habitats through an emergency rule. A full notice-and-comment period can take years, during which time irreplaceable coral and sponge habitat can be irrevocably altered and destroyed. Full rulemaking procedures can be conducted after emergency rules are in place to protect the resource, but it will do little good to have a full notice-and-comment rulemaking to protect habitats that have already been destroyed. Therefore, the benefits of taking immediate action through emergency regulations far outweigh the damage to these sensitive habitats that would occur through a full notice and comment rulemaking process.

Therefore, the Secretary should use his emergency authority to protect known deep-sea coral and sponge habitat from bottom trawling under 62 Fed. Reg. 44421 (August 21, 1997). He may do so without regard to whether the Councils have prepared an FMP. 16 USC§1855(c)(1). The existence of and damage to many of these habitats have been only recently discovered, and action by the Secretary is urgently needed to prevent destructive fishing practices from destroying these important habitats. The destruction of deep-sea coral and sponge habitat is a "serious conservation or management problem," and the benefits for addressing these impacts through emergency regulations far outweigh the value of delaying action through a deliberative rulemaking process. *Id.*

B. The Secretary Should Prepare FMPs and FMP Amendments to Identify and Protect Deep-Sea Coral and Sponge Habitat as EFH/HAPC if Councils Fail to Adopt Permanent Protections

The Secretary must, if necessary, prepare FMPs and FMP amendments to permanently protect deep-sea coral and sponge habitat if the Councils fail to adopt permanent protections. The Secretary, through NOAA, is authorized to prepare an FMP or amendment if: (1) the Council fails to develop and submit to the Secretary within a reasonable period of time a FMP or amendment if a fishery requires conservation and management; (2) the Secretary disapproves or partially disapproves a plan or amendment; or (3) the Secretary has the authority to prepare a plan or amendment under the Magnuson-Stevens Act. 16 USC §1854(c)(1)(A)-(C). If the Secretary prepares a plan or amendment under these provisions, he must prepare regulations to implement the plan or amendment, consult with other federal agencies, conduct public hearings, provide for public notice and comment, and submit the plan or amendment to the appropriate Council for consideration and comment. 16 USC §1854(c)(1-7).

The Secretary should notify the Councils that they have an immediate duty to commence rulemakings to make the protections in the Secretarial emergency rule permanent. In order to avoid a lapse in protection that might allow destructive fishing practices to irreparably harm coral and sponge habitat, the Secretary should coordinate his activities and the activities of the Councils so that Council FMP amendments will become effective at the expiration of the emergency rule period. In addition, if the Councils fail to timely submit FMP amendments, to ensure there is no lapse in protection, the Secretary must be prepared to immediately issue his own permanent rule to ensure continuing protection.

IX. Conclusion and Specific Actions Requested

The Secretary must designate and protect deep-sea coral and sponge EFH/HAPC under his authority to act in emergency situations, and/or where the Councils have failed to conserve and manage a fishery. Emergency action by the secretary is warranted here because the importance of coral and sponge habitats to fisheries and marine ecosystems, and the relatively recent discovery of these habitats and threats to their existence by bottom-tending mobile fishing gear, constitute a serious conservation and management problem as provided under 16 USC §1855(c)(1), and 62 Fed. Reg. 44421 (August 21, 1997).

The Secretary is also authorized to notify the Councils to immediately commence preparing a FMP or amendment to make permanent the protection of known coral and sponge habitat, and to identify and protect such habitat as necessary for the conservation and management of fisheries under 16 USC §1854(c)(1). Moreover, because coral and sponge are fish, the Magnuson-Stevens Act also requires regional councils and the Secretary to promulgate coral and sponge FMPs to protect coral and sponge habitat if these habitats are not protected in other FMPs.

A. Summary of Specific Actions Requested

For the reasons noted above, we request the Secretary to act immediately to protect deep-sea coral and sponge habitats by undertaking the following actions:

1. Identify, map, and list all known areas containing high concentrations of deep-sea coral and sponge habitat;
2. Designate all known areas containing high concentrations of deep-sea coral and sponge habitat both as EFH and HAPC, and close HAPC to bottom trawling;
3. Identify all areas not fished within the past three years with bottom-tending mobile fishing gear, and close such areas to bottom trawling;
4. Monitor bycatch to identify areas of deep-sea coral and sponge habitat that are being currently fished, establish appropriate limits or caps on bycatch of deep-sea coral and sponge habitat, and immediately close to bottom trawling areas where these limits or caps are reached until such time as the areas can be mapped, identified as EFH and HAPC, and permanently protected;
5. Establish a program to identify new areas containing high concentrations of deep-sea coral and sponge habitat through bycatch monitoring, surveys, and other methods, designate these newly discovered areas as EFH and HAPC, and close them to bottom trawling;
6. Enhance monitoring infrastructure, including observer coverage, vessel monitoring systems, and electronic logbooks for vessels fishing in areas where they might encounter high concentrations of deep-sea coral and sponge habitat (including encountering HAPC);
7. Increase enforcement and penalties to prevent deliberate destruction of deep-sea coral and sponge habitat and illegal fishing in already closed areas; and
8. Fund and initiate research to identify, protect, and restore damaged deep-sea coral and sponge habitat.

B. Explanation and Description of Actions Requested

1. The Secretary should immediately map and list all known areas containing high concentrations of deep-sea coral and sponge habitat. Many areas known to contain high concentrations of coral and sponge are not being protected because they have not been adequately identified and mapped. The Secretary must act quickly before these areas are destroyed.

2. Once known areas with high concentrations of coral and sponge have been identified and mapped, the Secretary should designate such areas as both EFH and HAPC pursuant to NOAA guidelines, and these HAPC should be closed to bottom trawling. These areas, at a minimum, should include areas reported in the literature cited herein and depicted on maps attached to this petition.

3. The Secretary should identify and close all areas to bottom trawling that have not been bottom trawled within the past three years. Many undisturbed areas

of the United States' EEZ contain pristine coral and sponge habitat precisely because they have not been bottom trawled. Although the Secretary may not know the location of many of these pristine areas, he does have information on where bottom trawling activities are occurring. The Secretary should use this information to identify where no trawling has occurred for at least three years, and close such areas to bottom trawling until they can be mapped, identified, and protected. This closure is a prudent and precautionary measure to ensure that pristine areas are not destroyed by new bottom trawling activities. Moreover, because these are areas that have not been bottom trawled for at least three years, a moratorium on bottom trawling in these areas will cause little if any economic harm.

4. In areas where surveys and reports have not been conducted, and bottom trawling is damaging deep-sea coral and sponge habitat, bycatch should be monitored to determine whether fishing operations are taking coral and sponge. The Secretary should establish appropriate limits or caps on deep-sea coral and sponge bycatch, and immediately close to bottom trawling areas where these limits or caps are exceeded, until such time as these areas can be properly mapped, identified, and permanently protected.

5. Through bycatch monitoring, surveys, and other programs, the Secretary should identify new areas containing high concentrations of deep-sea coral and sponge habitat. The Secretary must designate these areas as EFH/HAPC, and close them to bottom trawling immediately before they can be destroyed.

6. In order to facilitate identification and protection of deep-sea coral and sponge habitat, and to provide assistance to fishing vessels, the Secretary should enhance NOAA's monitoring infrastructure, including improved observer coverage, vessel monitoring systems, and electronic logbooks. Observers on bottom trawling vessels must be increased to levels approaching 100% to monitor bycatch to implement caps and gather data on the identification and location of coral and sponge habitat.

7. It does little good to designate and protect coral and sponge habitat as EFH/HAPC if areas closed to bottom trawling are inadequately enforced or if penalties are inadequate to prevent fishing in these sensitive areas. Therefore, enforcement and penalties must be reassessed to determine if they are adequate to prevent illegal fishing in already closed areas.

8. The Secretary must fund and initiate research to identify, protect and restore damaged deep-sea coral and sponge habitat. Recent studies have been helpful in identifying new areas of coral and sponge habitat. However, more research is urgently needed to discover new areas, and assess the extent, condition and importance of these new areas to fish, fisheries and marine ecosystems.

Thank you for the consideration of this petition.

Sincerely,

Michael F. Hirshfield, Ph.D.
Vice President, North American Oceans

REFERENCES

Andrews, A.H., E. Cordes, M.M. Mahoney, K. Munk, K.H. Coale, G.M. Caillet and J. Heifetz 2002. “Age, growth and radiometric age validation of a deep-sea, habitat-forming gorgonian (*Primnoa resedaeformis*) from the Gulf of Alaska.” Hydrobiologia 471: 101–110, 2002.

Breeze, H., D.S. Davis, M. Buter and V. Kostylev. 1997. “Distribution and Status of Deep-sea Corals off Nova Scotia.” Marine Issues Committee Special Publication No. 1. Halifax, NS: Ecology Action Centre. 58 pp..

Cairns, S.D. and R.E. Chapman 2001. "Biogeographic affinities of the North Atlantic deep-water scleractinia." In Willison, J.H., J, Hall, S.E. Gass, E.L.R. Kenchington, M. Butler and P. Doherty, 2001. "Proceedings of the First International Symposium on Deep-Sea Corals."

Clarke, T. "Fishing scars Atlantic reefs." Nature Online, 26 February 2002. At http://www.nature.com/nsu/020225/020225-2.html.

Etnoyer, P and L. Morgan 2002 DRAFT. "Occurrences of habitat forming deep-sea corals in the Northeast Pacific Ocean: A report for NOAA's Office of Habitat Protection." Marine Conservation Biology Institute.

Fossaa, J.H., Mortensen, P.B., Furevik, D.M., 2002. “The deep-water coral *Lophelia pertusa* in Norwegian waters: distribution and fishery impacts.” Hydrobiologia 471, 1-12.

Freese, L., P. J. Auster, J. Heifetz, and B. L. Wing. 1999. “Effects of trawling on seafloor habitat and associated invertebrate taxa in the Gulf of Alaska.” Marine Ecology Progress Series 182:119-126.

Freiwald, A. 2002. "Reef-forming cold-water corals." In Wefer, G., D. Billet, D. Hebbeln, B.B. Jorgensen, M. Schluter, and T. Van Weering (eds.) 2002. "Ocean Margin Sytems." Springer-Verlag Berlin Heidelberg, pp 365-385.

Gell, F.R. and C.M.Roberts 2003. “Benefits beyond Boundaries: The fishery effects of marine reserves.” Trends in Ecology and Evolution, 2003, 18:9:448-455.

Goad, M. "Gulf of Maine yields coral forest." Portland Press Herald August 4, 2002.

Gordon, J. D. M. 2001 “Deep-water fisheries at the Atlantic Frontier.” Continental Shelf Res. 21, 987–1003.

Hall-Spencer, J., V. Allain and J.H. Fossa. 2002. “Trawling damage to Northeast Atlantic ancient coral reefs.” Proceedings of the Royal Society of London. 269: 507-511.

Heifetz, J. 2000. "Coral in Alaska: Distribution, abundance, and species associations." Manuscript presented at the First International Symposium on Deep-sea Corals, Dalhousie University, Halifax, July 30 - August 2, 2000.

Heifetz, J., 2002. “Coral in Alaska: distribution, abundance, and species associations.” Hydrobiologia. 471: 19–27.

Hixon, M.A., Tissot, B.N., and W.G. Pearcy 1991. “Fish assemblages of Rocky Banks of the Pacific Northwest.” OCS Study MMS 91-0052. Pacific OCS Region, Minerals Management Service.

Husebo, A., L. Nottestad, J.H. Fossa, D.M. Furevik and S.B. Jorgensen 2002. "Distribution and abundance of fish in deep-sea coral habitats." Hydrobiologia 471: 91-99.

ICES 2002. “Report of the Study Group on Mapping the Occurrence of Cold-water Corals” International Council for the Exploration of the Sea Advisory Committee on Ecosystems ICES CM 2002/ACE:05 Ref: E, WGECO.

Koenig, C.C. 2001. "Oculina Banks: Habitat, fish populations, restoration, and enforcement." Report to the South Pacific Fishery Management Council December 2001.

Koslow, J.A., K.G. Holmes, J.K. Lowry, T. O'Hara, G.C.B. Poore and A. Williams 2001. "Seamount benthic macrofauna off southern Tasmania: community structure and impacts of trawling." Marine Ecology Progress Series 213: 111-125.

Krieger, K.J. 2001. "Coral (Primnoa) impacted by fishing gear in the Gulf of Alaska." In: J.H.M. Willison *et al.*, (editors). "Proceedings from the First International Symposium on Deep-sea Corals." 106-116. Halifax, NS: Ecology Action Centre and NS Museum.

Krieger, K. J. & B. L. Wing, 2002. "Megafauna associations with deepwater corals (*Primnoa* spp.) in the Gulf of Alaska." Hydrobiologia 471: 83–90.

Lees, D. "Coral champions." Canadian Geographic, May/June 2002.

Malecha, P.W., Stone, R.P. and J. Heifetz 2002 (DRAFT). "Living substrate in Alaska: Distribution, abundance and species associations." Manuscript submitted at the Symposium on Effects of Fishing Activities on Benthic Habitats, Tampa, Florida, November 12-14, 2002.

Moore, J.A., Vecchione, M., Collette, B.B., and R. Gibbons 2002. "The fauna of Bear Seamount (New England Seamount chain), and the presence of "natural invader" species." Paper presented at ICES 2002 Annual Science Conference summarizing the results of cruise DE02-06. CM 2002/M:25.

MMS 2000. "Gulf of Mexico Deepwater Operations and Activities Environmental Assessment." OCS EIS/EA, MMS 2000-00,1Gulf of Mexico OCS Region, Minerals Management Service.

NMFS (National Marine Fisheries Service) 2003a. Draft Programmatic Supplemental Groundfish Environmental Impact Statement for Alaska Groundfish Fisheries, September 2003, Tables 3.5-158 and 4.1-8.

NMFS, 2003b. Unpublished data from RACEBASE

NOAA Ocean Explorations: Gulf of Mexico, 2002. Ship's log and more details available at http://oceanexplorer.noaa.gov/explorations/02mexico/logs/oct18/oct18.html

NOAA Ocean Explorations: Exploring Alaska's Seamounts, 2002. Ship's log and more details available at http://oceanexplorer.noaa.gov/explorations/02alaska/logs/jul15/jul15.html

NOAA Ocean Explorations: Islands in the Stream, 2002. Ship's log and more details available at http://oceanexplorer.noaa.gov/explorations/02sab/logs/aug22/aug22.html

NOAA 2002c. Ocean Explorations: Islands in the Stream 2002. Ship's log and more details available at http://oceanexplorer.noaa.gov/explorations/02sab/logs/aug29/aug29.html

NOAA 2002d. Ocean Explorations: Islands in the Stream 2002. Ship's log and more details available at http://oceanexplorer.noaa.gov/explorations/02sab/logs/aug22/aug22.html

NOAA 2003. Oceana explorations: Mountains in the Sea. Ship's log and more details available at http://oceanexplorer.noaa.gov/explorations/03mountains/welcome.html

NOAA 2003. "Exploring the Davidson Seamount." Electronic media, produced in cooperation by NOAA Monterey Bay National Marine Sanctuary, Monterey Bay Aquarium, Monterey Bay Aquarium Research Institute, and NOAA Office of Exploration.

NRC 2002. "Effects of trawling and dredging on seafloor habitat." Committee on Ecosystem Effects of Fishing: Phase 1 -- Effects of Bottom Trawling on Seafloor Habitats, National Research Council

Paull CK, Neumann AC, am Ende BA, Ussler W, Rodriguez NM, 2000. "Lithoherms on the Florida - Hatteras Slope." Mar Geol 166:83-101.

Poppe, L.J. and C.F. Polloni 2000. "USGS East-Coast Sediment Analysis: Procedures, Database, and Geo-referenced Displays." United States Geological Survey Open-File Report 00-358.

Reed, J.K. 2002a. "Comparison of deep-water coral reefs and lithoherms off southeastern USA." Hydrobiologia 471: 57-69.

Reed, J.K. 2002b. "Deep-water *Oculina* coral reefs of Florida: biology, impacts, and management." Hydrobiologia 471: 43-55.

Roberts CM, Bohnsack JA, Gell F, Hawkins JP, and R. Goodridge 2001. "Effects of marine reserves on adjacent fisheries." Science 294:1920-1923.

Roberts, J.M, Gage, J.D., and ICES Advisory Committee on Ecosystems party 2003. Assessing biodiversity associated with cold-water coral reefs: pleasures and pitfalls. Oral presentation at Second International Symposium on Deep Sea Corals, Erlangen, Germany, September 9–12, 2003.

Rogers, A.D., 1999. "The biology of *Lophelia pertusa* (Linnaeus 1758) and other deep-water reef-forming corals and impacts from human activities." Int. Rev. Hydrobiol. 84, 315-406.

Schroeder, W.W., Brooke, S.D., Olson, J.B., Phaneuf, B., McDonough III, J.J. and P. Etnoyer, in press. "Occurrence of deep-water *Lophelia pertusa* and *Madrepora oculata* in the Gulf of Mexico." In, 'Deep-Water Corals and Ecosystems', Freiwald, A. and Roberts, M.J. eds., Springer Publishing, Heidelberg. Proceedings of the 2nd International Symposium on Deep-Sea Corals, Sept 8-13, Erlangen, Germany.

Stone, R.P. and Malecha, P.W. 2003. "Deep-Sea Coral Habitat in the Aleutian Islands of Alaska" Oral Presentation given at the Second International Symposium on Deep-sea Corals, Erlangen, 2003.

Sulak K. pers. comm.. Dr Kenneth Sulak, USGS; presentation to the House Oceans Caucus and NMFS March 14 2003, background materials.

Theroux, R.B. and R.L. Wigley 1998. "Quantitative composition and distribution of the macrobenthic invertebrate fauna of the continental shelf ecosystems of the northeastern United States." United States Department of Commerce. NOAA Technical Report NMFS 140.

Tracey, D., Neil, H., Gordon, D., and S. O'Shea 2003. "Chronicles of the deep: Ageing deep-sea corals in New Zealand waters." NIWA, Water & Atmosphere 11(2) 2003.

UK Biodiversity Group, 1999. Tranche 2 Action Plans. Volume V – Maritime Species and Habitats. Peterborough, English Nature.

Watling, L., P. Auster, I. Babb, C. Skinder, and B. Hecker. 2003. "A Geographic Database of Deepwater Alcyonaceans of the Northeastern United States Continental Shelf and Slope." Version 1.0 CD-ROM. National Undersea Research Center, University of Connecticut, Groton.

Watling, L, and P.J. Auster 2003 DRAFT. "A Preliminary Summary of the Distribution, Status, and Ecological Role of Deepwater Corals off the Northeast Coast of the United States." Presentation to NEFMC EFH Technical Team, July 10 2003.

Watling, L, and P.J. Auster 2004 in press. “Distribution of Deepwater Alcyonacea off the Northeast Coast of the United States”. Proceedings of the Second International Symposium on Deep-sea Corals, Erlangen Germany, 2003.

FIGURES

Figure 1: Locations of reported coral and sponge bycatch by bottom fishing on federally observed groundfish vessels and NOAA trawl surveys in Alaskan waters.

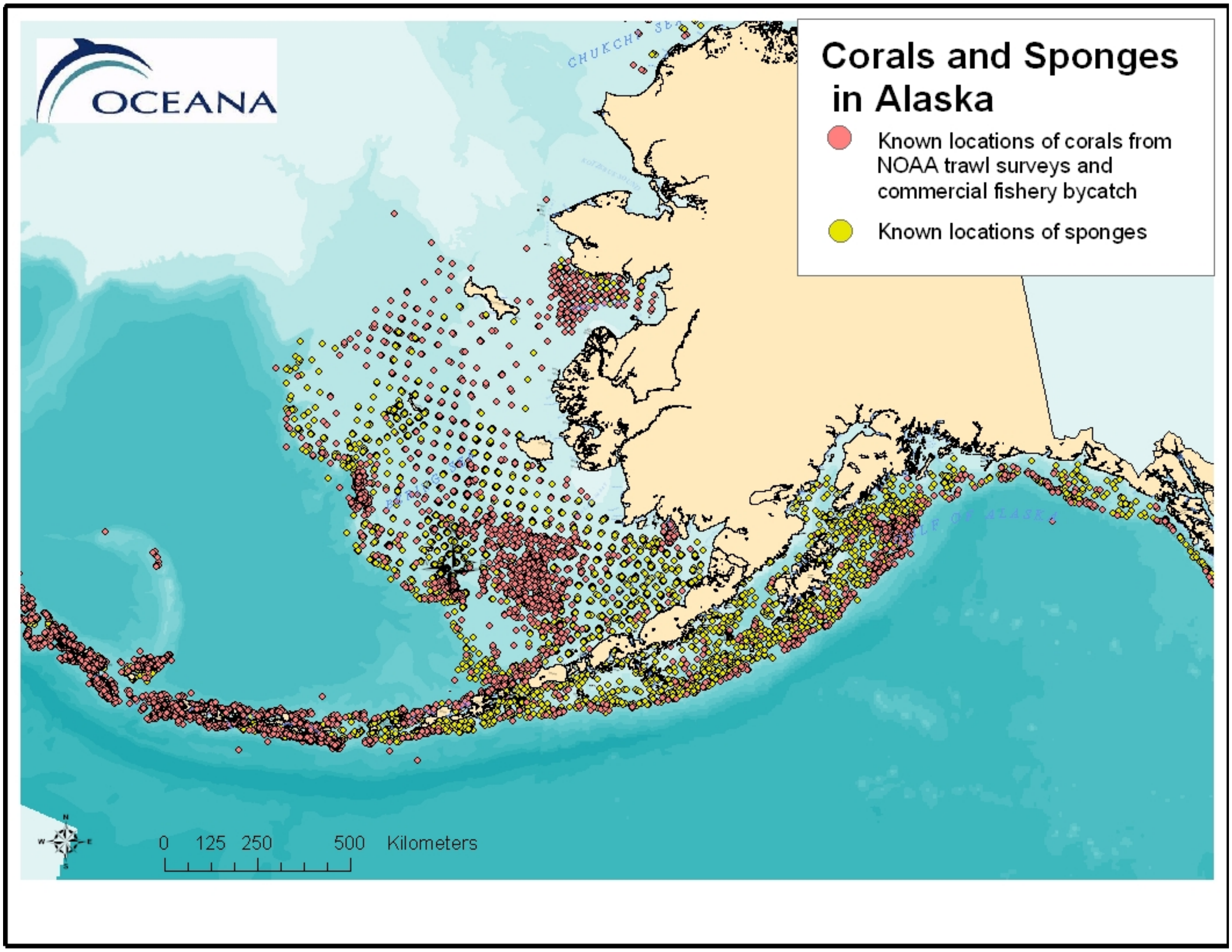


Figure 2a: Overview of six HAPC proposal areas for Coral Gardens in the Aleutian Islands, NMFS, January 9, 2004.

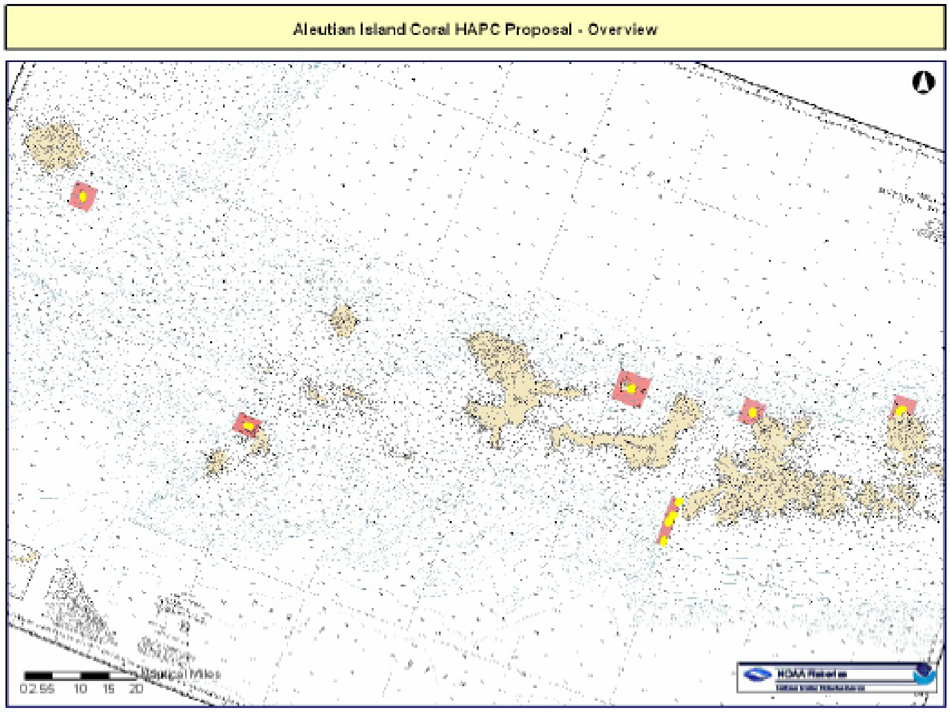


Figure 2b: Adak Canyon Coral Gardens fine scale

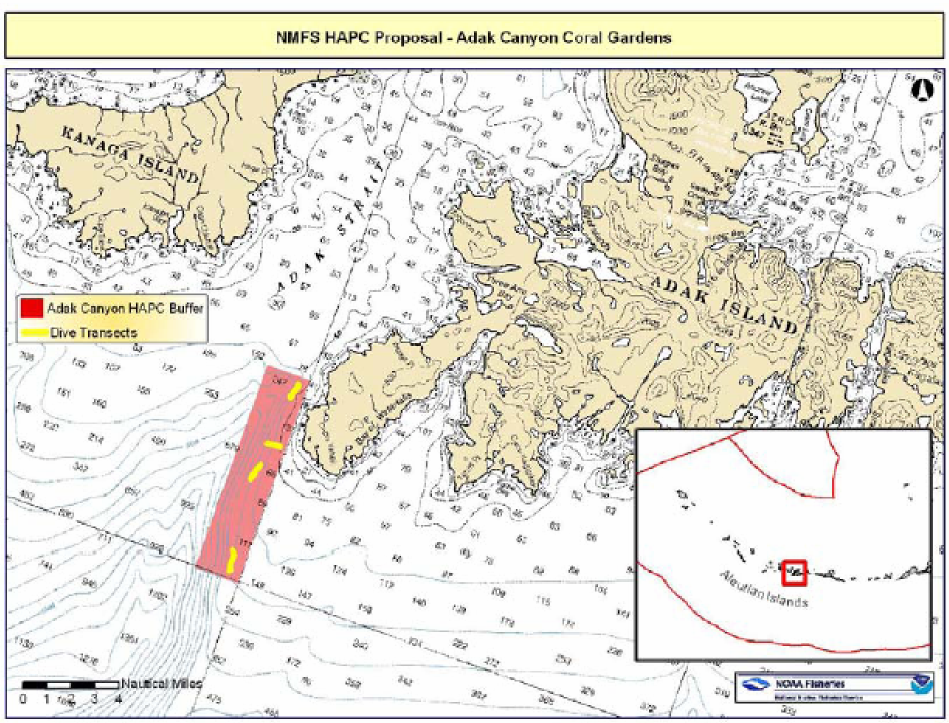


Figure 2c: Bobrof Island Coral Gardens fine scale

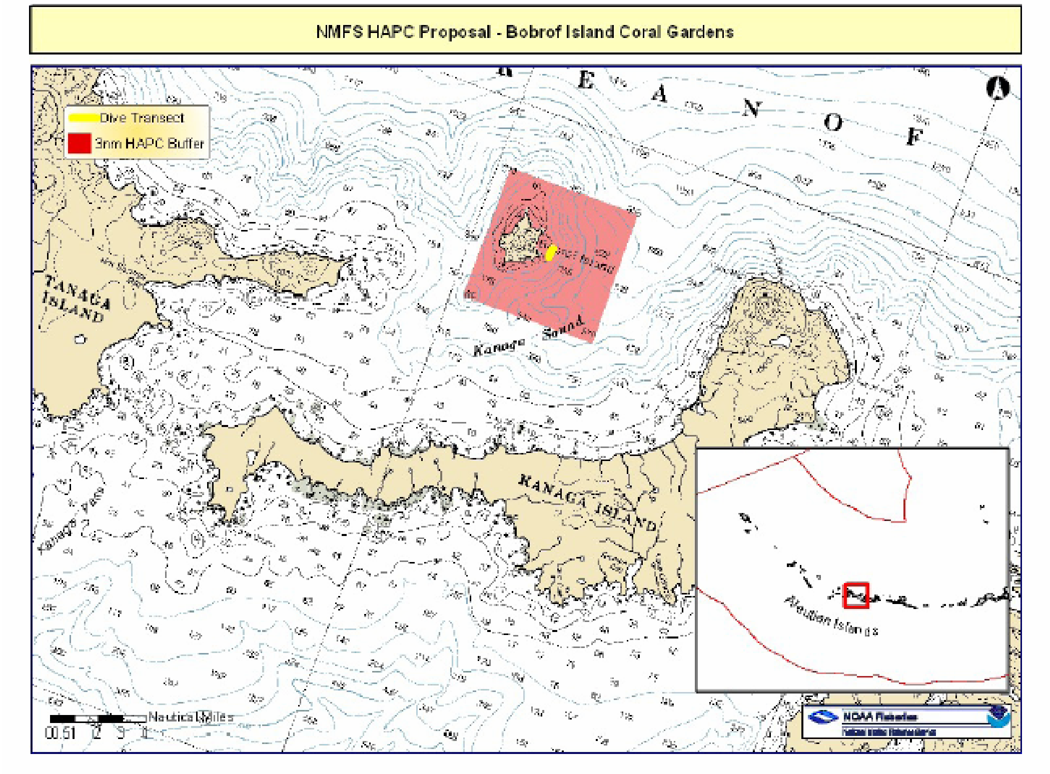


Figure 2d: Cape Moffett Coral Gardens fine scale

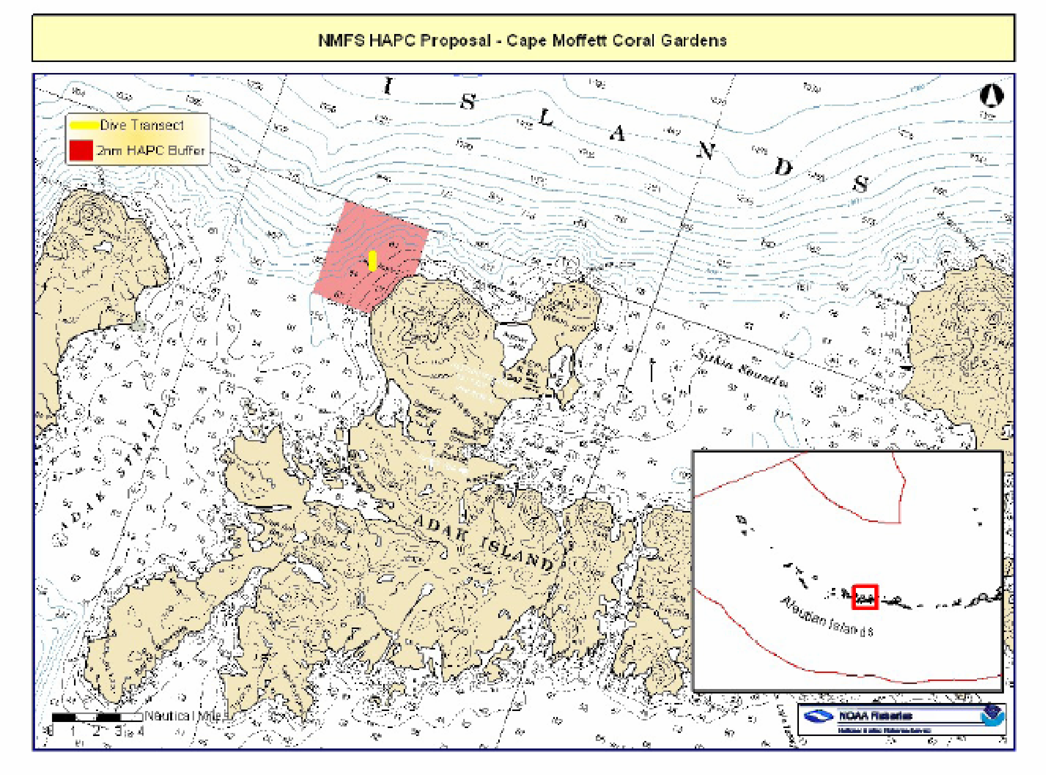


Figure 2e: Great Sitkin Coral Gardens fine scale

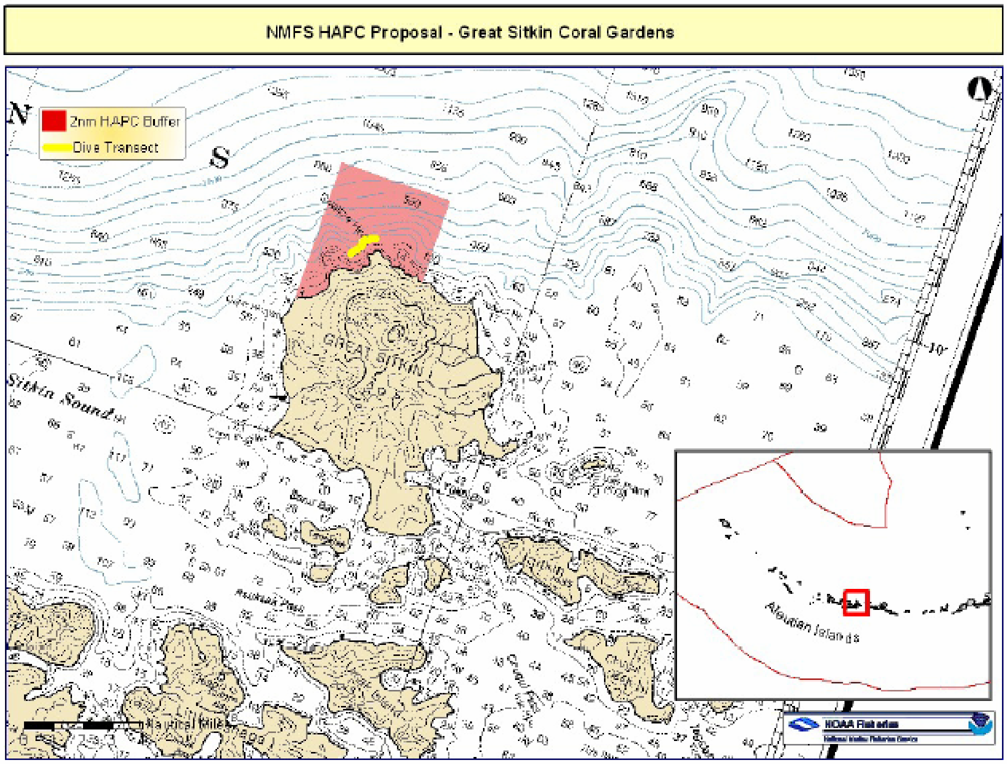


Figure 2f: Semisopochnoi Island Coral Gardens fine scale

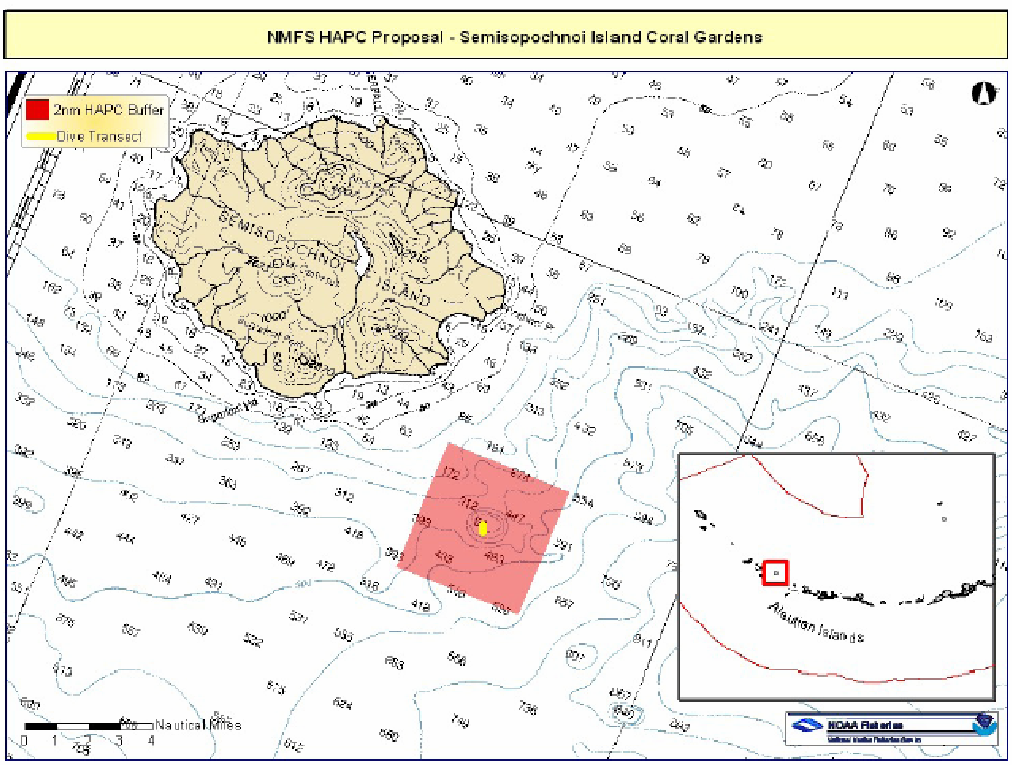


Figure 2g: Ulak Island Coral Gardens fine scale

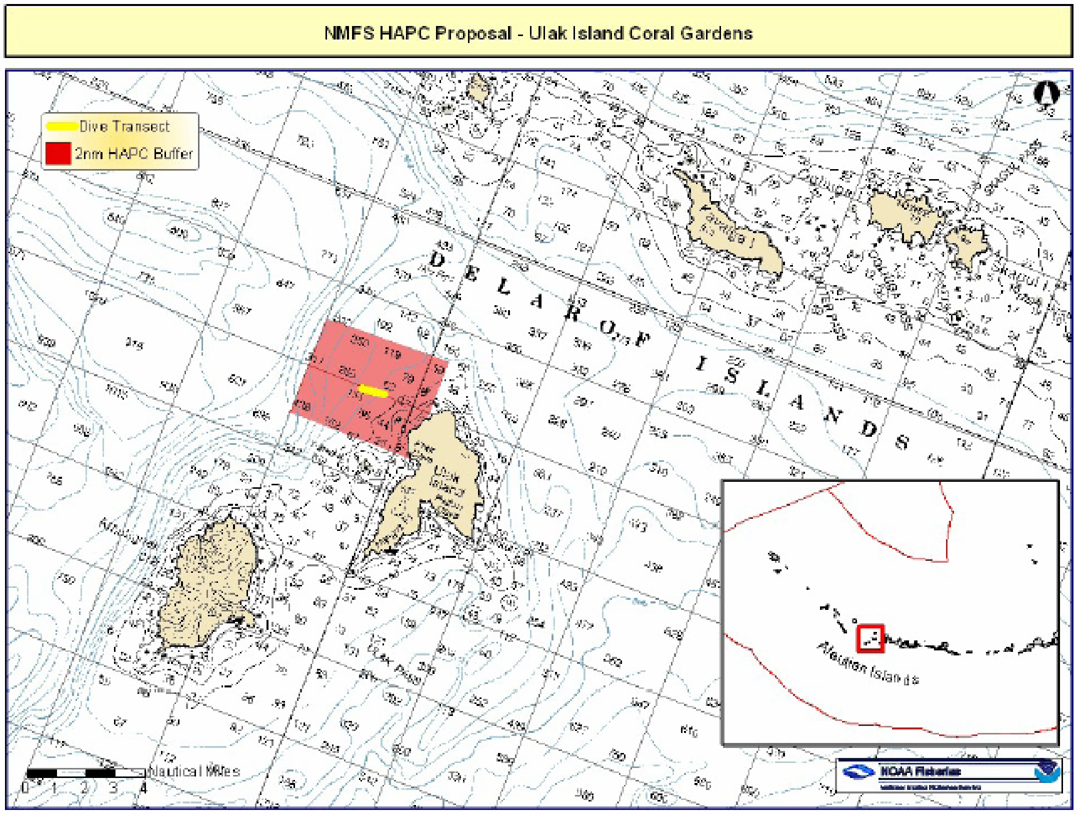


Figure 3: Geographic locations of Daisy Bank and Hecata Bank off the coast of Oregon. Courtesy Hixon *et al.* 1991.

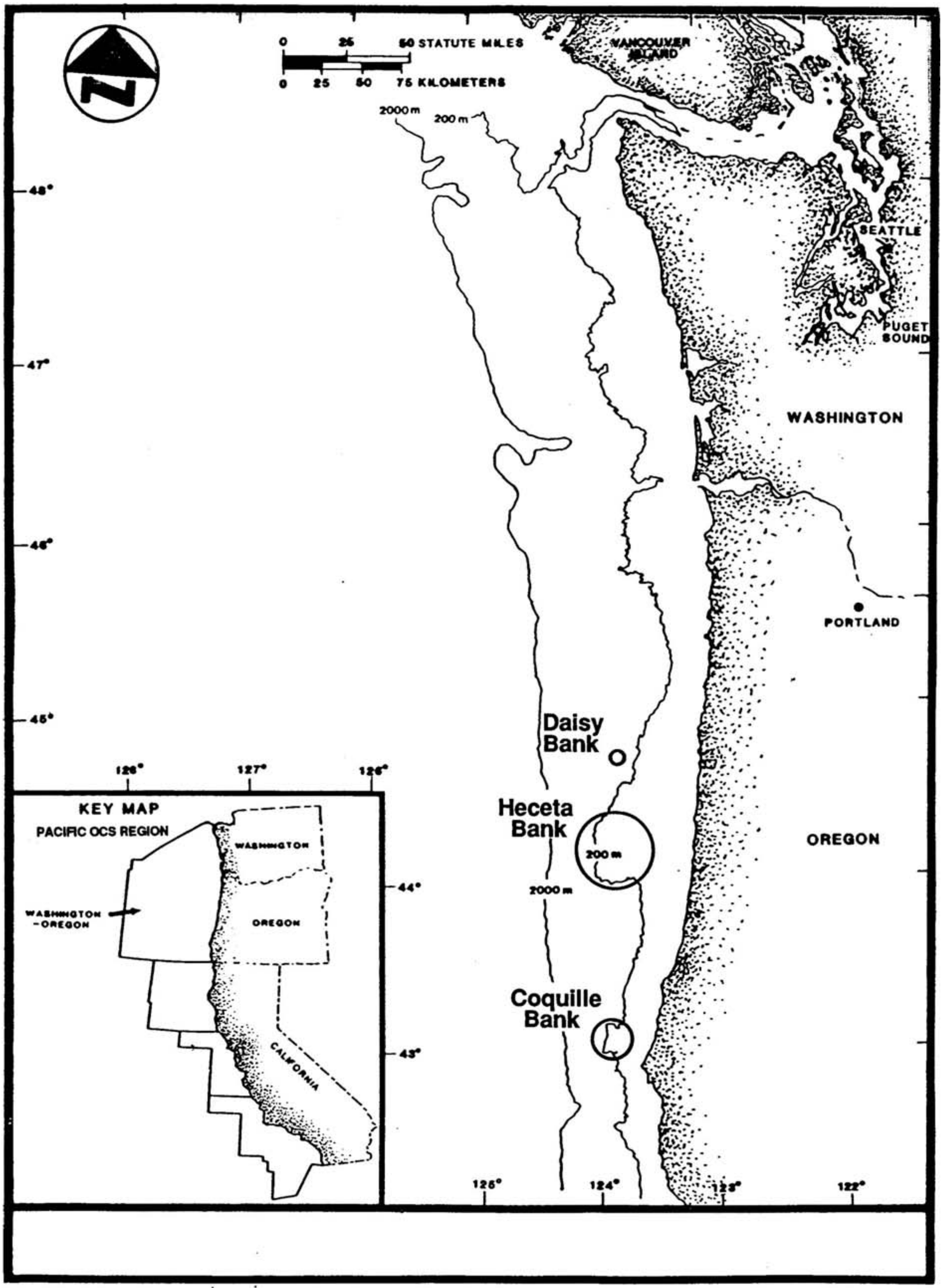


Figure 4: Coral occurrence along the Pacific Coast of North America. GIS map based on data from NMFS trawl survey data and NMFS observer data, the latter only in Alaska.

Figure 5: Sponge occurrence along the Pacific Coast of North America. GIS map based on data from NMFS trawl survey data and NMFS observer data, the latter only in Alaska.

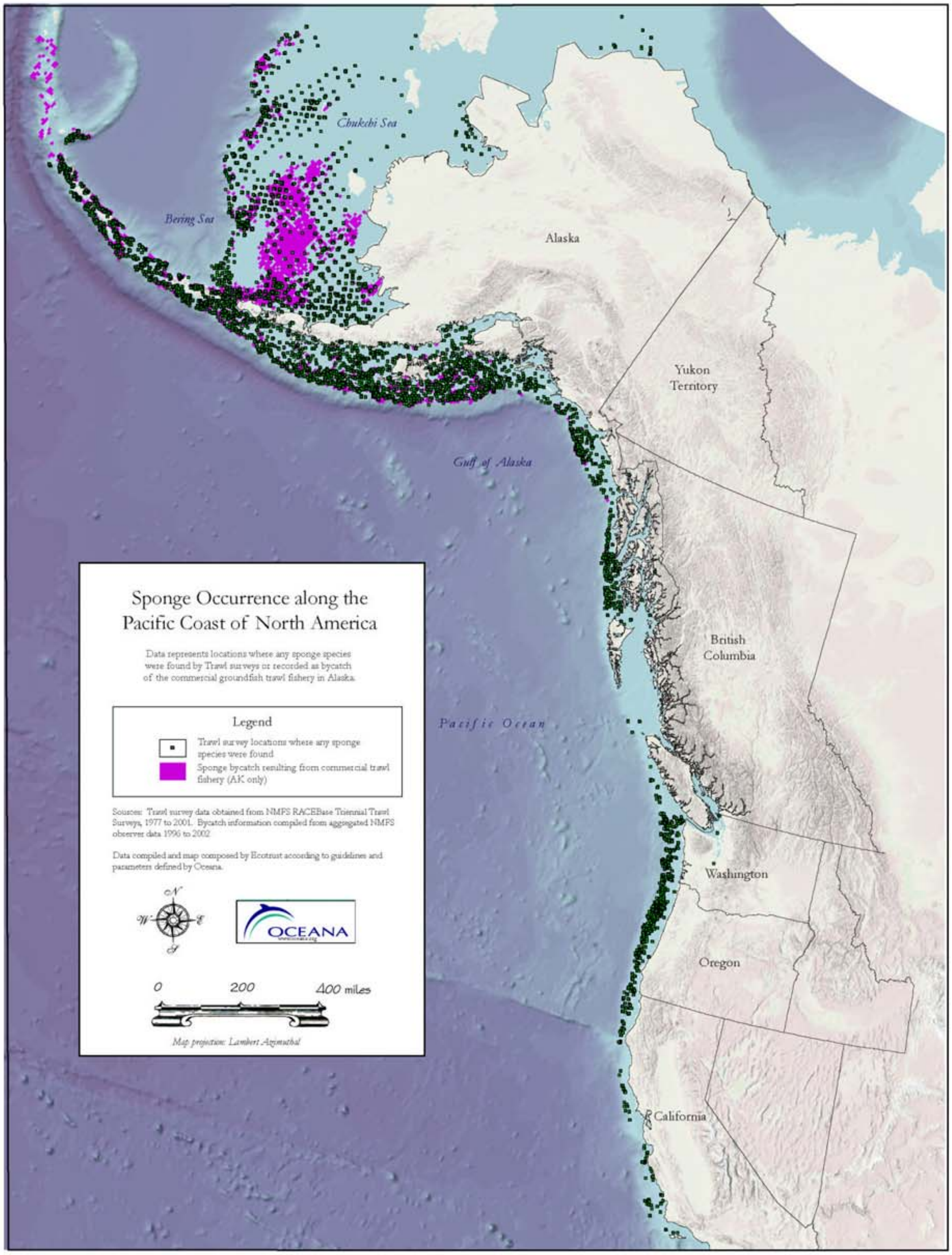


Figure 6: Geographic distribution of alcyonarians off the northeast United States. From Theroux and Wigley 1998.

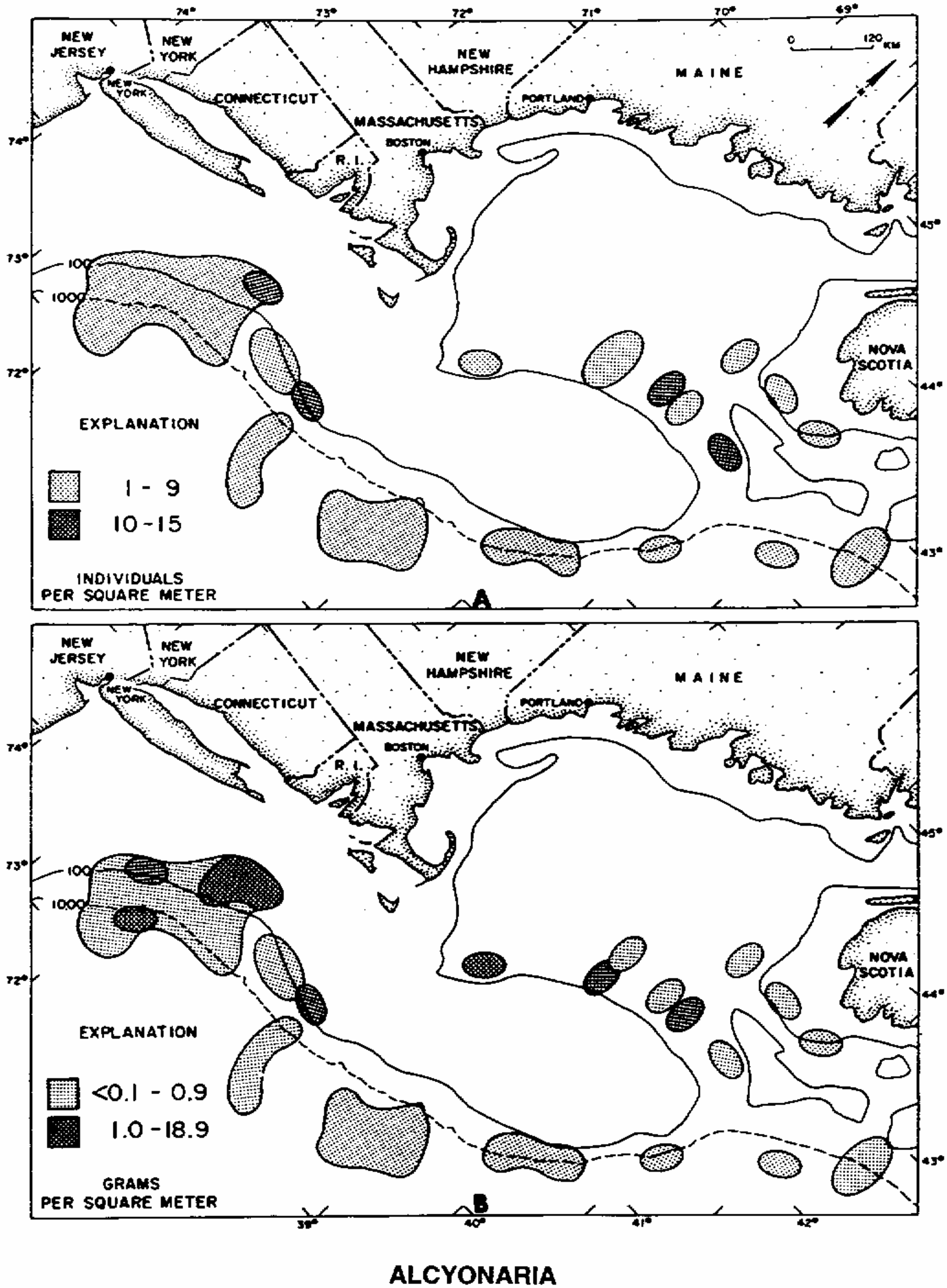
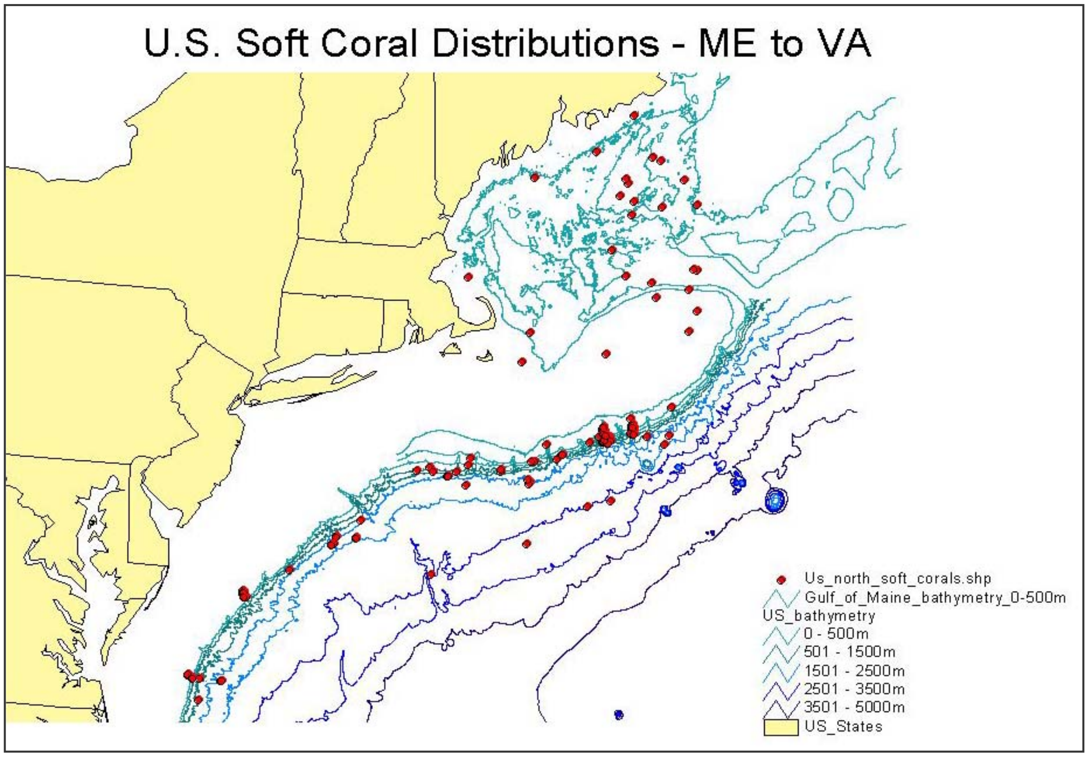


Figure 7: Regional scale distribution of alcyonaceans across the northeast continental shelf region based on 761 records in Watling *et al.* 2003. 'Two Canyons' shows finer scale distribution of corals in Oceanographer and Lydonia Canyons.



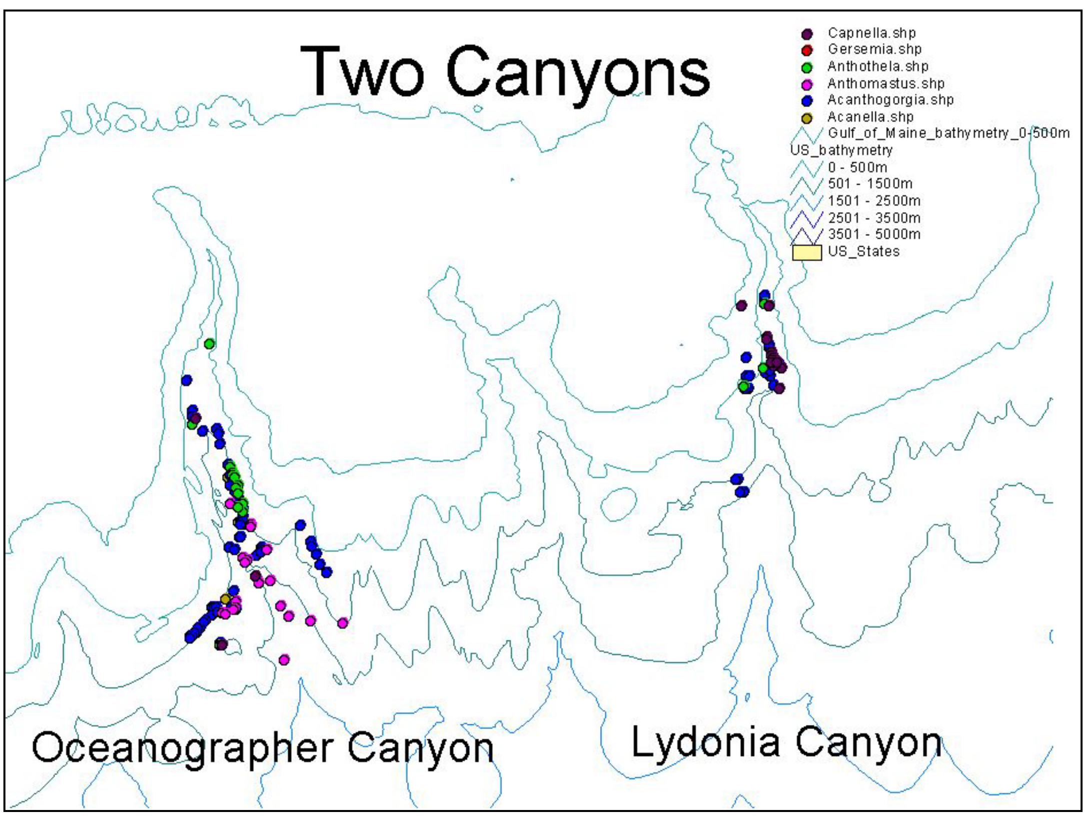


Figure 8: Deep-water coral banks off the southeastern USA. A, Oculina Banks; A1, Oculina EORR (for more detailed maps of the Oculina Banks see **Figure 10**); B-E, Lophelia/Enallopsammia coral banks. Courtesy Reed 2002a.

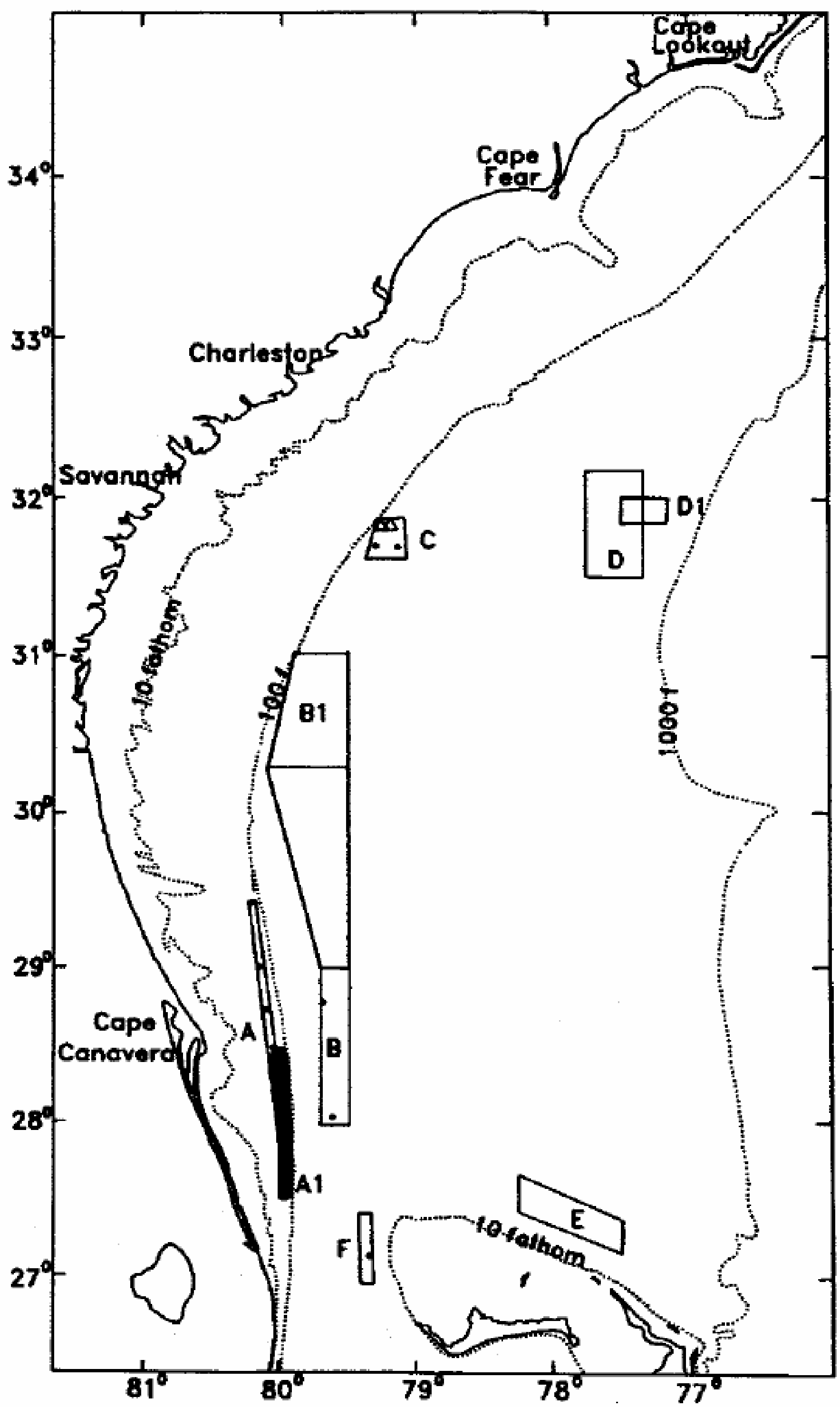


Figure 9: Deep-water coral banks off North Carolina. Courtesy Ross, NCERR and Sulak, USGS.

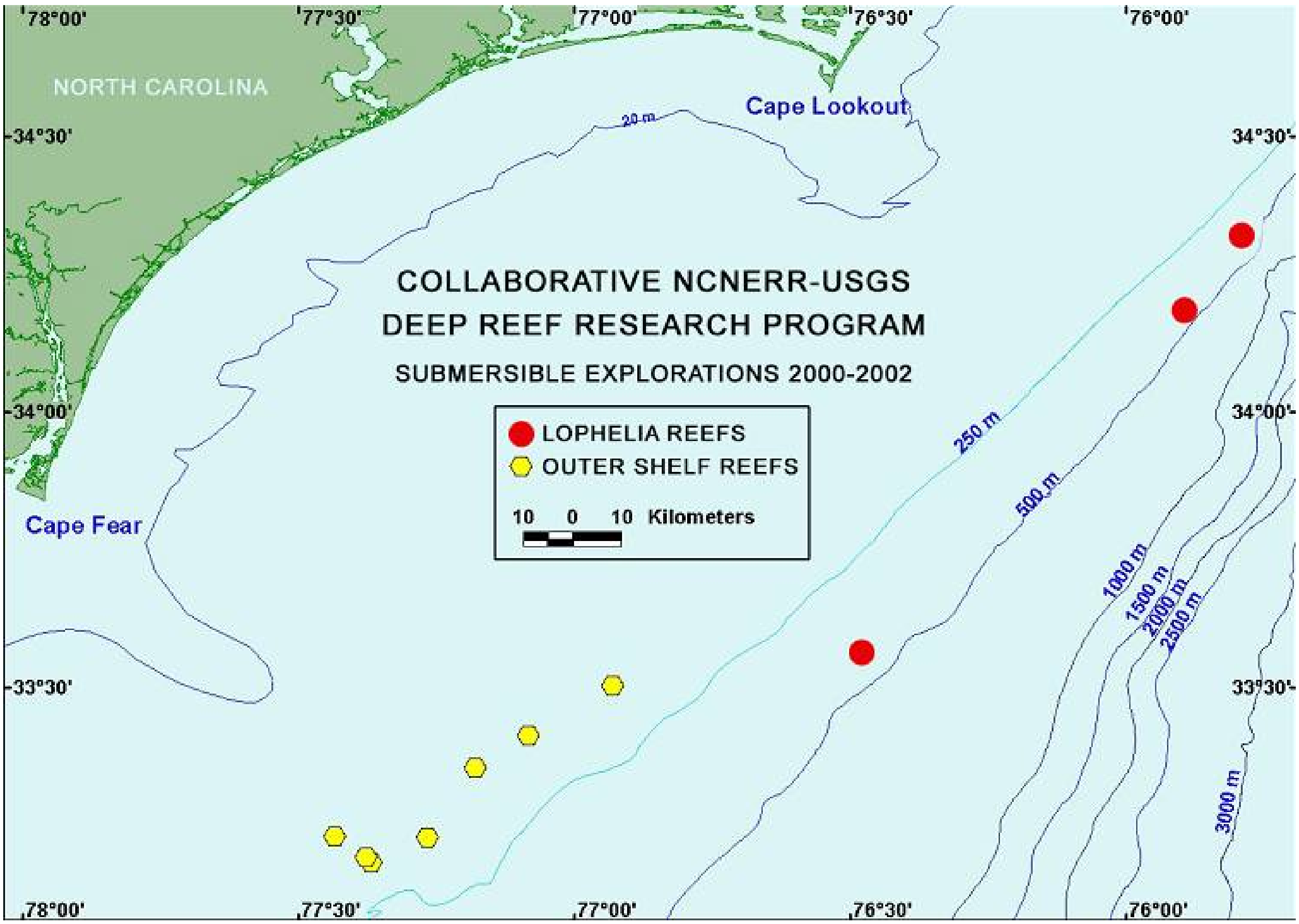


Figure 10: The *Oculina* Banks Habitat Area of Particular Concern (OHAPC), including the Experimental *Oculina* Research Reserve (EORR) showing dive areas visited in 2001 (numbers 1-6). Dots are historic dive sites visited in the 1970s and 1980s. Dive areas: 1. Cape Canaveral, 2. Cocoa Beach, 3. Eau Gallie, 4. Sebastian, 5. Chapman's Reef, and 6. Jeff's Reef. Note: the shaded area is the entire OHAPC, the EORR is the smaller inset box. Courtesy Koenig 2001.

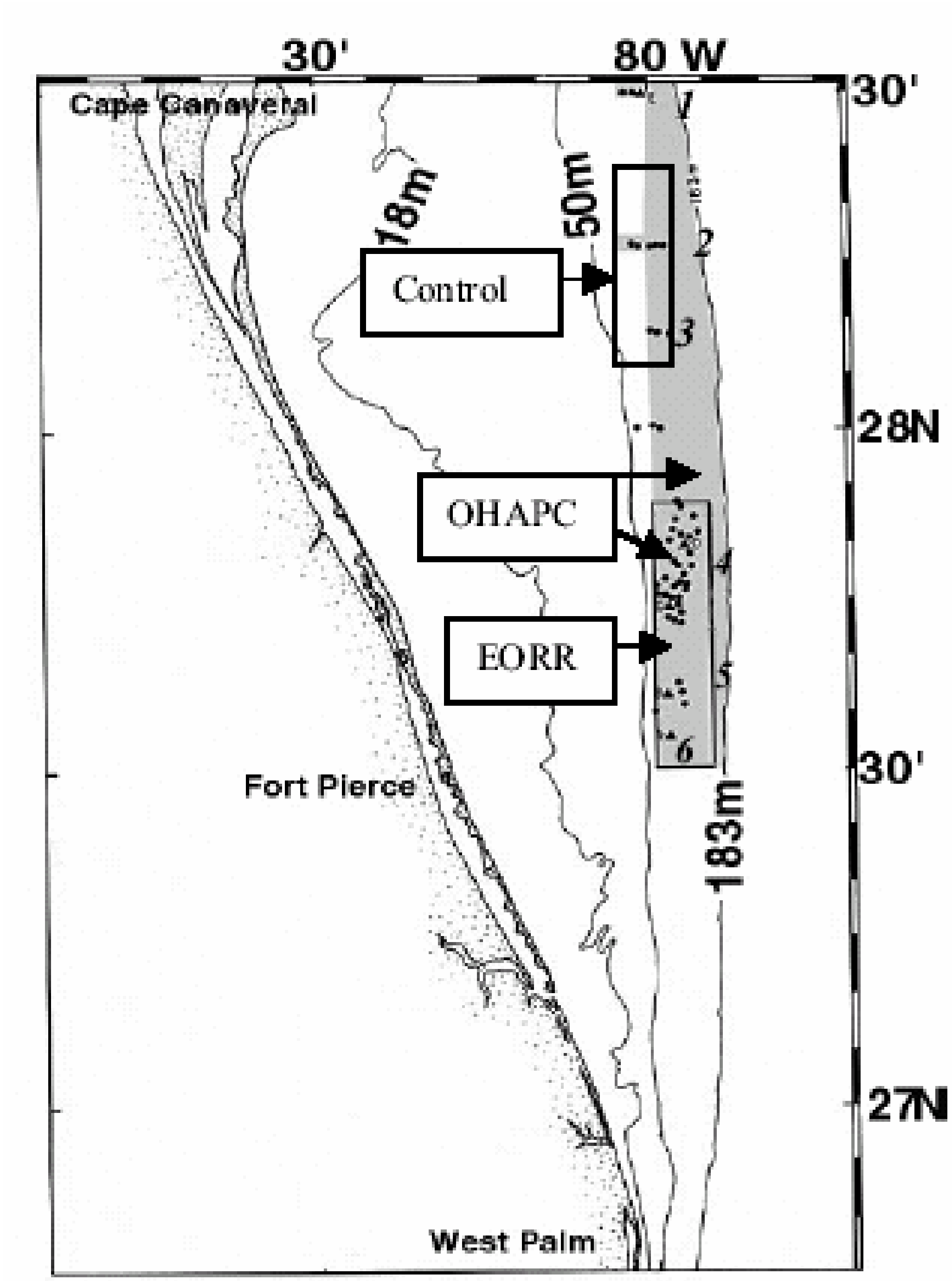


Figure 11: Known locations of *Lophelia pertusa* and *Madrepora oculata* in wters deeper than 200m in the Gulf of Mexico. Sources documented: (1) published material, (2) the 2003 National Museum of Natural History Taxonomic Database, (3) findings obtained during the September-October 2003 NOAA-OE RV Ronald H. Brown cruise RB-03-07-leg-2 in the northern Gulf, and (4) from various unpublished sources. Courtesy Schroeder *et al.* in press.

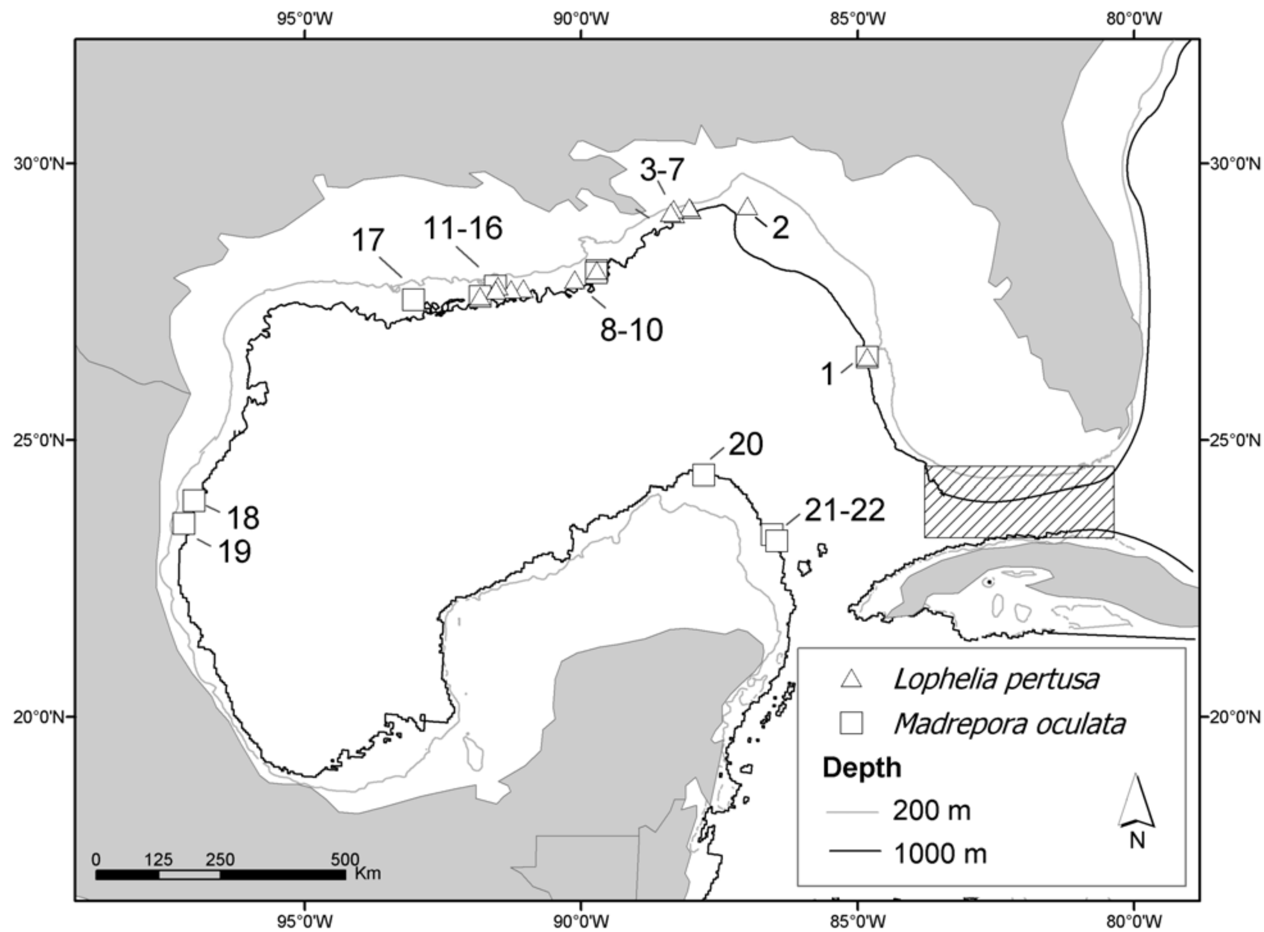
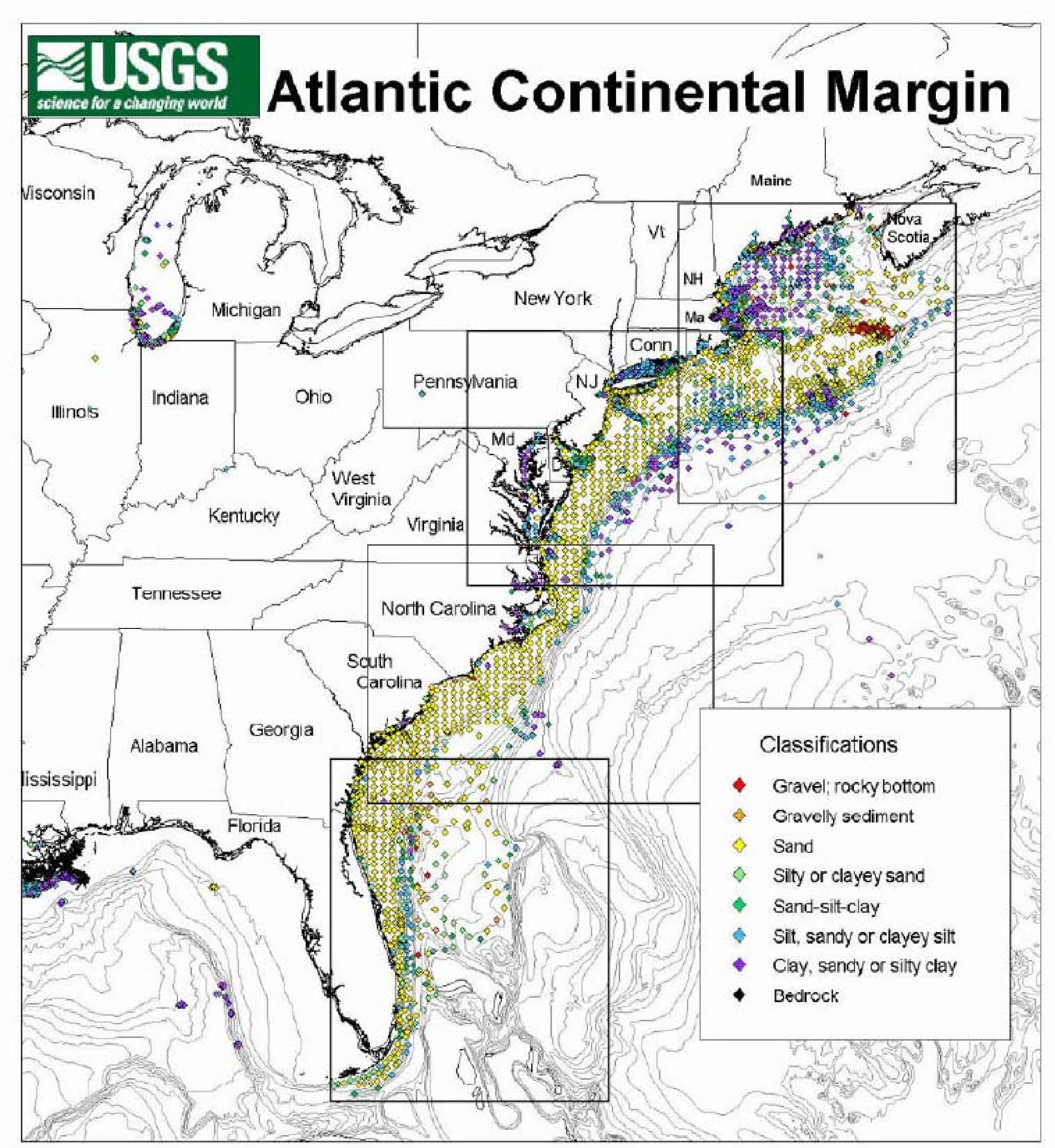


Figure 12: Distribution of sediment samples catalogued in the US Geological Survey database for the Atlantic Continental Margin. Courtesy Poppe and Polloni 2000, in NRC 2002.



APPENDICES

Appendix 1

Known coral and sponge concentrations around the US. These areas are not meant to be all inclusive; they are simply examples of the types of area that exist around North America. These areas should be given priority when applying HAPC designations and bans on bottom trawling.

Name/Area	Latitude and Longitude Coordinates
Oceanographer Canyon	40°30′ N. x 68°11′ W., 40°10′ N. x 68°10′ W., and 40°10′ N. x 68°00′ W.
Lydonia Canyon	40°36′ N. x 67°45′ W., 40°15′ N. x 67°45′ W., and 40°15′ N. x 67°35′ W.
Bear Seamount	39°52′ N. x 67°30′ W., 39°58′ N. x 67°50′ W., 39°58′ N. x 67°50′ W., and 39°52′ N. x 67°50′ W.
Oculina Reefs	27°30′ N. x 80° W., 28°30′ N. x 80° W., and the 183 meter contour.
	28°30′ N. x 80° W., 28°30′ N. x 80°03′ W., 28°29′ N. x 80° W., and 28°29′ N. x 80°03′ W.
	28°17′ N. x 80° W., 28°16′ N. x 80° W., 28°17′ N. x 80°03′ W., and 28°16′ N. x 80°03′ W.
Lophelia/Enallopsammia Reefs	31° N. x 79°50′ W., 31° N. x 79°30′ W., 30°20′ N. x 80°10′ W., and 30°20′ N. x 79°30′ W.
	30°20′ N. x 80°10′ W., 30°20′ N. x 79°30′ W., 29°00′ N. x 79°45′ W., and 29° N. x 79°30′ W.
	29° N. x 79°45′ W., 29° N. x 79°30′ W., 28° N. x 79°45′ W., and 28° N. x 79°30′ W.
	31°55′ N. x 79°20′ W., 31°55′ N. x 79° W., 31°35′ N. x 79°25′ W., and 31°35′ N. by 79° W.
	32°12′ N. x 77°45′ W., 32°12′ N. x 77°20′ W., 31°30′ N. x 77°45′ W., and 31°30′ N. x 77°20′ W.
	32° N. x 77°10′ W., 32° N. x 77°10′ W., 31°48′ N. x 77°20′ W., and 31°48′ N. x 77°10′ W.
Daisy Bank	44°38′ N. x 124°43′ W., 44°40′ N. x 124°43′ W., 44°38′ N. x 124°45′ W., 44°40′ N. x 124°45′ W.
Coral Gardens in the Aleutians	Adak Canyon 51° 38' 59" N. x 177° 03' 00" W., 51° 38' 59" N. x 177° 00' 00" W., 51° 30' 00" N. x 177° 00' 00" W., 51° 30' 00" N. x 177° 03' 00" W.
	Bobrof Island 51° 57' 36" N. x 177° 29' 24" W., 51° 57' 36" N. x 177° 19' 48" W., 51° 51' 35" N. x 177° 19' 48" W., 51° 51' 35" N. x 177° 29' 24" W.
	Cape Moffet 51° 55' 47" N. x 176° 52' 47" W., 51° 55' 47" N. x 176° 48' 36" W., 51° 58' 11" N. x 176° 46' 48" W., 52° 00' 00" N. x 176° 46' 48" W., 52° 00' 00" N. x 176° 52' 47" W.
	Great Sitkin 52° 09' 35" N. x 176° 12' 36" W., 52° 09' 35" N. x 176° 05' 59" W., 52° 06' 35" N. x 176° 05' 59" W., 52° 04' 47" N. x 176° 12' 36" W.
	Semisopochnoi Island 51° 53' 24" N. x 179° 53' 23" W., 51° 53' 24" N. x 179° 46' 48" W., 51° 48' 36" N. x 179° 46' 48" W., 51° 48' 36" N. x 179° 53' 23" W.
	Ulak Island 51° 22' 11" N. x 178° 58' 47" W., 51° 25' 47" N. x 179° 05' 59" W., 51° 22' 11" N. x 179° 05' 59" W., 51° 25' 47" N. x 178° 58' 47" W.

Appendix 2

Known seamounts and pinnacles in Alaskan waters, most are unexplored. As these types of areas have been identified as frequently harboring concentrations of corals and sponges, they should be closed until such time as research has been completed to determine whether they warrant long-term protection as HAPC. These areas are not meant to be all inclusive.

Name/Area	**Latitude and Longitude Coordinates**
Pinnacles in the Aleutians	53° 51’ 30” N. x 165° 57′ W.
	53° 15’ 30” N. x 168° 51′ W.
	53° 41′ N. x 167° 11′ W.
	53° 32’ 30” N. x 167° 20′ W.
	53° 26′ N. x 167° 44′ W.
	52° 46′ N. x 168° 52′ W.
	52° 51′ N. x 169° 15’ 30” W.
	52° 57′ N. x 169° 35’ 30” W.
	52° 41′ N. x 169° 40′ W.
	52° 29′ N. x 169° 52′ W.
	52° 19’ 30” N. x 171° 48′ W.
	52° 25’ 30” N. x 172° 09′ W.
	52° 31’ 30” N. x 172° 10′ W.
	52° 40′ N. x 172° 03′ W.
	52° 36’ 30” N. x 172° 41′ W.
	51° 58′ N. x 173° 05′ W.
	54° 17′ N. x 165° 18′ W.
	54° 19’ 30” N. x 165° 59’ 30” W.
	53° 39′ N. x 168° 23′ W.
	53° 13′ N. x 169° 46′ W.
	52° 57′ N. x 169° 29′ W.
	52° 49′ N. x 170° 13′ W.
	52° 49′ N. x 170° 29′ W.
	52° 17′ N. x 170° 42′ W.
	52° 35′ N. x 172° 20′ W.
	52° 35′ N. x 173° 15′ W.
	52° 32′ N. x 173° 26′ W.
	52° 28′ N. x 173° 36′ W.
	51° 56′ N. x 174° 14′ W.
	51° 56′ N. x 174° 22′ W.
	52° 16′ N. x 175° 07′ W.
	51° 34′ N. x 178° 13′ W.
	51° 24′ N. x 178° 33′ W.
	51° 08′ N. x 179° 00′ W.
	51° 23′ N. x 179° 31′ W.
	51° 29′ N. x 179° 52′ W.
	52° 28′ N. x 179° 45′ W.
	53° 51′ N. x 179° 56′ W.
	54° 10′ N. x 179° 55′ W.
	54° 24′ N. x 179° 47′ W.
	54° 39′ N. x 179° 11′ W.
	54° 50′ N. x 178° 43′ W.
	51° 31′ N. x 179° 52′ W.
	51° 51′ N. x 179° 50′ W.
	52° 52′ N. x 179° 57′ W.
	52° 18′ N. x 179° 53′ W.
	51° 25′ N. x 178° 58′ W.

	51° 37′ N. x 179° 07′ W.
	51° 39′ N. x 179° 01′ W.
	51° 58′ N. x 178° 53′ W.
	51° 48′ N. x 177° 52′ W.
	51° 47′ N. x 177° 12′ W.
	51° 41′ N. x 176° 54′ W.
	52° 11′ N. x 176° 59′ W.
	52° 07′ N. x 176° 45′ W.
	52° 19′ N. x 176° 41′ W.
	51° 57′ N. x 176° 39′ W.
	51° 50′ N. x 176° 19′ W.
	52° 17′ N. x 176° 12′ W.
	52° 21′ N. x 176° 20′ W.
	51° 40′ N. x 175° 53′ W.
	52° 26′ N. x 175° 47′ W.
	51° 51′ N. x 175° 18′ W.
	51° 51′ N. x 175° 08′ W.
	51° 54′ N. x 174° 58′ W.
	52° 17′ N. x 175° 07′ W.
	52° 03′ N. x 174° 41′ W.
	52° 05′ N. x 174° 47′ W.
	52° 29′ N. x 174° 55′ W.
	52° 35′ N. x 174° 47′ W.
	52° 23′ N. x 174° 27′ W.
	52° 15′ N. x 174° 20′ W.
	52° 19′ N. x 174° 13′ W.
	52° 30′ N. x 173° 24′ W.
	52° 31′ N. x 173° 18′ W.
	52° 37′ N. x 173° 10′ W.
	53° 00′ N. x 172° 16′ W.
	52° 52′ N. x 172° 06′ W.
	53° 04′ N. x 170° 57′ W.
	52° 57′ N. x 170° 52′ W.
Seamounts in the Aleutians	ADAMS 50° 1' 12" N. x 176° 13' 48" W.
	ATKA 50° 16' 12" N. x 175° 10' 12" W.
	BOWERS 54° 4' 48" N. x 174° 46' 48" W.
Pinnacles in the Gulf Of Alaska (2 mile radius circle centered at the following coordinates)	54° 55.0′ N. x 157°32.0′ W.
	56° 18.0′ N. x 154° 56.0′ W.
	55° 35.0′ N. x 154° 27.0′ W.
	56° 40′ N. x 156° 42’ 30” W.
	56° 22’ 30” N. x 152° 56′ W.
	57° 56′ N. x 154° 50′ W.
	58° 50′ N. x 151° 44′ W.
	58° 54′ N. x 150° 56′ W.
	59° 09′ N. x 151° 12′ W.
	58° 58′ N. x 153° 16’ 30” W.
	59° 01’ 30” N. x 153° 16′ W.
	59° 07′ N. x 153° 45′ W.
	59° 12′ N. x 153° 33′ W.
	59° 18′ N. x 150° 32′ W.
	59° 28′ N. x 149° 40′ W.
	59° 33’ 30” N. x 149° 49’ 30” W.
	60° 01′ N. x 147° 00′ W.
	59° 04′ N. x 151° 21′ W.
	59° 08′ N. x 152° 03′ W.
	59° 44′ N. x 144° 40′ W.

	59° 50′ N. x 142° 31′ W.
	56° 40′ N. x 156° 45′ W.
	56° 37′ N. x 156° 51′ W.
	56° 43′ N. x 156° 55′ W.
	56° 41′ N. x 157° 20′ W.
	56° 29′ N. x 157° 37′ W.
	56° 24′ N. x 157° 51′ W.
	56° 04′ N. x 158° 18′ W.
	54° 30′ N. x 159° 44′ W.
	54° 19′ N. x 160° 52′ W.
	55° 06′ N. x 161° 19′ W.
	54° 58′ N. x 161° 23′ W.
	54° 55′ N. x 161° 23′ W.
	54° 42′ N. x 161° 35′ W.
	54° 39′ N. x 161° 51′ W.
	54° 48′ N. x 162° 41′ W.
	54° 45′ N. x 162° 51′ W.
	54° 37’ 30” N. x 162° 50’ 30” W.
	54° 30′ N. x 163° 14′ W.
	54° 21′ N. x 163° 10′ W.
	56°23′ N. x 157° 32′ W.
	55° 23′ N. x 159° 40′ W.
	59° 14′ N. x 151° 58′ W.
	59° 57′ N. x 152° 28′ W.
	58° 07′ N. x 149° 04′ W.
	58° 00′ N. x 149° 39′ W.
	57° 44′ N. x 149° 58′ W.
	57° 27′ N. x 152° 06′ W.
	57° 15′ N. x 151° 43′ W.
	56° 55′ N. x 151° 46′ W.
	56° 40′ N. x 152° 09′ W.
	56° 20′ N. x 152° 26′ W.
	56° 01′ N. x 153° 41′ W.
Seamounts in the Gulf of Alaska	UNIMAK 53° 40' 12" N. x 162° 30' W.
	DERICKSON 52° 49' 48" N. x 161° 15' W.
	SIRIUnited States 52° N. x 160° 49' 48" W.
	PUTNAM 51° 32' 60" N. x 160° 25' 12" W.
	STEVENS 48° 8' 60" N. x 158° W.
	CHIRIKOF 54° 55' 48" N. x 152° 49' 48" W.
	MARCHAND 54° 55' 26.4" N. x 151° 21' 46.8" W.
	HECHT 53° 45' N. x 151° 19' 48" W.
	PATTON 54° 35' 24" N. x 150° 26' 52.8" W.
	ODESSEY 54° 30' N. x 149° 45' W.
	KODIAK 56° 49' 48" N. x 149° 15' W.
	WYER 54° 25' 12" N. x 148° 40' 12" W.
	GIACOMINI 56° 30' N. x 146° 19' 48" W.
	ELY 56° 15' N. x 145° 40' 12" W.
	DALL 58° 10' 12" N. x 145° 34' 48" W.
	QUINN 56° 15' N. x 145° 15' W.
	WELKER 55° 7' 12" N. x 140° 19' 48" W.
	BROWN 55° N. x 138° 30' W.
	DENSON 54 N. x 137° 15' W.
	DICKINS 54° 30' N. x 137 W.
	PIERCE 53° 43' 48" N. x 136° 31' 48" W.